THE
ELECTRICAL REVIEW.

VOL. LXIII. NOVEMBER 13, 1908. No. 1,616.

ELECTRICAL REVIEW

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THE ELECTRICAL REVIEW.

Published every FRIDAY Price 4d.

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OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGREEAY, LONDON." Code, A B C.

Telephone Nos. Holborn 903 Central 4495 (Editorial only).

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FOREIGN AGENTS.—New York: D. VAN NOSTRAND, 23, Murray Street. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. Paris: BOUVEAU & CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

Cheques and Postal Orders (on Chief Office, London), to be made payable to Mr. H. ALABASTER, 4, Ludgate Hill, E.C.

THE
UNIVERSAL ELECTRICAL DIRECTORY
(J. A. BERLY'S).

1908 EDITION

H. ALABASTER, GATEHOUSE & CO.,
4, Ludgate Hill, London, E.C.

THE UNEMPLOYED.

THE scheme proposed by the Government for alleviating the distress arising from unemployment, and the opinions expressed by various speakers during the discussion thereon in the House of Commons, have, as is only natural, furnished matter for much criticism in the daily Press; but there are some points bearing on this problem which do not appear to us to have been brought forward as prominently as they deserve.

The most important of these has reference to the rate of wages to be paid to the unemployed, as on the regulation of this rate must depend the amount by which the cost of work executed by the unemployed will exceed the cost of ordinary contract work. So far as the speeches in the House throw any light on the subject, it would appear that the intention is to pay the standard rate of wages which would be earned by an able-bodied workman accustomed to the particular class of work; although it is evident that, if the majority of the unemployed in any district are to benefit, a large number of them will be set to do work for which they are not really fit, and that consequently the work done by them will not be equal, either in quantity or quality, to that done by the men for whom the standard rate of pay has been fixed. That this result is expected is shown by the Government proposal to contribute a grant to cover the difference between the cost of contract labour and that of unemployed labour—a difference which, according to the Prime Minister, may be as much as 30 to 40 per cent., but which many people who had experience of relief works a few years ago will put at a still higher figure.

This proposal to contribute a grant for the purpose stated is open to very grave objection, as it creates a dangerous precedent, and will probably tend to produce in the future a worse condition of affairs than exists at present. In order to show clearly our reasons for making the above statement, we must first consider briefly the connection which exists between the price of labour and the amount of unemployment. As the price of labour is one of the several factors which determine the cost of a manufactured article, and as, wherever there is competition, an increased cost will diminish sales, the manufacturer, who pays a higher rate of wages for the same work than his competitor, is to that extent at a disadvantage, and is likely to get a smaller share of the orders, and therefore to have less employment to offer to the workman. In the same way, if in any country an artificial standard of wages is maintained, and this standard is higher than is warranted by the conditions of trade, then a similar result will follow; and we consider that the amount of unemployment in Great Britain is largely due to the maintenance of such a standard of wages, and to the loss of trade resulting from the strikes which have been ordered to prevent any lowering of this standard.

There is another way in which the existence of a fixed

standard wage for all the men of a trade in any district increases the distress due to want of employment; and that is, that when all men are being paid at the same rate, the inferior workmen are always the first to be discharged when slack times come, and the last to get permanent employment again when trade improves; with the result that there is a set of men who are only very intermittently employed, and have, therefore, no chance of making any provision which will tide them over the time when they are out of work. The above considerations show that, in addition to the class of men who are unemployed because they do not desire regular work, there are also many who are in this state because they have not sufficient skill to compete on level terms with the majority of their fellow workmen.

The objection to a special Government grant which will enable the same rate of wages to be paid to men who either do not want to give a fair return in labour, or are from want of skill unable to do so, as to the men who are both able and willing, is that it will tend to largely increase the number of men who will not give a fair day's work in return for their wage. Such men will have no incentive to seek work, but will register themselves as unemployed, and will demand as a right that they shall be paid the standard rate of wages in return for an amount of work which may be just as little as it pleases them to do. This cannot fail to have a deteriorating effect on other workmen, who hitherto have been able to get and keep employment because they were able and willing to do a good day's work; it is asking too much of human nature to expect that such men, when they see others getting the same pay for much less work, will maintain the same standard as before. If the excess cost of labour resulting from this is paid for out of a Government grant, the evil is likely to be further aggravated, because neither the employer nor his foremen will have the same incentive to exercise a proper supervision, as they would have if all the wages had to be paid by the employer.

We do not propose here to discuss the large question of whether it is wise to hurry forward work, which in the normal state of affairs, would have been executed some months later—we have already referred briefly to the point—but, assuming that it has been decided to provide work for the unemployed, we maintain that it is not fair, either to the majority of the workmen, or to the taxpayer, that the unemployed should be paid the standard wage, and so be put on an equality of earning power with men who have shown their greater worth by being able to keep in employment. We therefore suggest to the Government, and to all Corporations who are making special arrangements for relief work, that the fairer way is to offer work to all who register themselves as unemployed at, say, half the standard rate of wage for each particular class of work, and only to increase this rate when the workman has shown, by the quantity and quality of his work, that he is worth more. By this means the cost of work done by the unemployed might be kept down to that of ordinary contract work, and the men themselves would have an inducement to do their best, as in this way only could they get their wages increased.

This suggestion will, of course, be condemned by the advocates of the "Right to Work," as their interpretation of this phrase appears to be the right to receive wages at a certain rate which has been fixed by themselves; and they do not concern themselves as to how the money is to be provided, nor do they appear to remember that, if this right is conceded, it must apply universally. In this connection, we would conclude these remarks by suggesting to those Trade Union leaders who have been claiming for all men the inalienable right to work, that they should remember this when a strike is under discussion; as first, the interests of different trades are so closely connected that a strike in one trade must always deprive a number of men in other trades of their right to work; and, secondly, that this right cannot be conceded only to the members of certain Trade Unions, but that the non-union man must also be allowed the right to work at the wages he has fixed for himself.

Co-partnership approved by the Men.

By a majority of 10 to 1 the scheme of co-partnership offered by Sir Christopher Furness to his workmen has been approved. The decision has come as a surprise to those who were in a position to form an opinion as to the probable reception of the proposal, and it has shown once more how far in advance of the Trade Union leaders are the rank and file. The attitude of the Labour leaders, it will be remembered, is to have nothing whatever to do with any scheme of profit-sharing between employers and employed, and it is opposed also to the principle of a Works' Council upon which the men are directly represented. The position is, in fact, the same as in 1901, when Mr. Barnes, the then secretary of the Amalgamated Society of Engineers, said "leave workshop management to workshop managers, and profits to those who want them."

The scheme which has been approved by the men by such an overwhelming majority provides that each man shall take up 10 £1 shares in the works, the purchase money being deducted, if desired, from the weekly wages at the rate of 5 per cent. per week.

The amount so invested will bear interest guaranteed at 4 per cent. per annum. All profits, after paying 5 per cent. dividend to the ordinary shareholders, will be divided equally between the shareholders and the men. The men are to be represented on a Works Council, and all disputes are to be settled amicably without recourse to strikes or lock-outs. Such, in brief, is the scheme to which the men representing 17 societies have agreed to give a trial for a period of 12 months.

A period of 12 months is too short for a conclusive test of the merits and practicability of the system. The real strain will come when, after a run of prosperity, a bad year is experienced in which no profits are made. This it was, coupled with the hostility of the Trade Unions, which years ago wrecked the profit-sharing scheme at Messrs. Briggs's collieries in Yorkshire. We hope the Furness proposal will receive a fair trial, and that the men will not be disappointed with the results when they find that 4 per cent. per annum, on £10, is only 8s., and that this is all they will individually receive as their share of the profits, unless a dividend of more than 5 per cent. is earned for the ordinary shareholder.

It must not be supposed, as it might from the manner in which Sir Christopher Furness's proposals were received by the daily Press, that profit-sharing between employer and employed had never before been thought of, and that it is a wonderful and epoch-marking discovery destined to settle once and for all the question of unemployment and all other troubles in the industrial world.

So far from this being the case, the truth is that in any commercial undertaking where profits are made, the wages paid to the workers, whether brain-workers or manual workers, represent a share of those profits. Sometimes, in fact, the

wages represent the whole of the profit, the capitalist or shareholder receiving nothing at all. True, the workman does not generally regard his wages in this light. Because wages are paid regularly week by week, it is not realised that they are profits paid in advance. But what else can they be? Wages for work done it is true, but for doing what? For converting raw material into a steam engine, a motor-car, an Atlantic liner, or an ocean tramp. For converting £1,000 worth of raw material into a finished article worth, say, £2,000. Who gets this profit of £1,000? Not the capitalist. If he gets 10 per cent. on his capital he is unusually fortunate. Part of it goes to pay for rent, rates and taxes, &c., but the bulk of it, as a rule, goes in advance to labour.

It is very largely due to the fact that wages are not recognised as part profits, that most of the attempts to carry on so-called profit-sharing schemes have resulted in failure or dissatisfaction.

The fact is, that compared to the wages paid, there is so little to share at the end of even a good year, that the individual workman is very little better off for it. The disillusionment is a bitter pill to swallow, and he cannot understand it. How is it, he asks himself, that the capitalist-employer is so very much better off than I am, if things are shared out fairly and squarely?

Admitted that there is, or should be, a community of interests between employer and employed, that each is entitled to a fair share of the joint profits of capital and labour, upon what basis are we to proceed in seeking to determine the relative shares which capital and labour should take? The following illustration will serve to indicate how very difficult a problem it is to allocate the profits on any acceptable percentage basis. Let us take the case of a small capitalist who employs 10 men, each of whom is paid on the average £2 a week. In the course of one year over £1,000 has been paid in wages. The employer pays himself, say, at the rate of 10 per cent. on the total value of the wages paid, so that he receives about £100 a year, or the same as the individual workman. No one would dream of raising any objection to this. But suppose, now, that his capital enables him to employ 100 men, paying them at the same rate as before, and taking his 10 per cent. on the value of the wages. His share will now be £1,000 a year. Is he looked upon as a public benefactor for providing work to support 100 families in comfort? Do the leaders of labour rejoice that their employer is better off, and gratefully recognise that the wealthier the employer becomes the greater the number of people he can employ? Oh dear no; he is immediately regarded as an exploiter of labour for his own selfish greed; a useless parasite battening on the vitals of the labouring class; an enemy to be crushed out of existence. Any scheme of profit-sharing which, at the end of the financial year, does not add a sum which materially increases the average wages of the workman, will be regarded with suspicion and distrust; and if past attempts in this direction are any criterion upon which to base a prophecy, such a scheme is foredoomed to failure.

Nor must it be taken for granted that profit-sharing schemes, however successful, will necessarily solve the problem of unemployment. That they may prevent strikes and lock-outs is possible, and this in itself will be no small achievement; but it is to be feared that the direct effect on unemployment will be to increase rather than to decrease it, unless the industrial peace resulting from the more harmonious relationship between capital and labour should result, as well it may, in a larger volume of work, and work of a more regular nature. For when each man is directly interested in the profits of the establishment, the tendency will be towards restricting their numbers, rather than the restriction of output, and towards an increase rather than a diminution in the hours of work.

This is, of course, the secret of the official opposition of Trade Unionism to profit-sharing systems, for, paradoxical as it may seem, profit-sharing schemes are anti-Socialistic.

However, we repeat that we should like the scheme to have a fair trial, unhampered by Trade Unionist interference; and if it does nothing more than prove to the men that profits, when fairly divided, do not mean that all shall be rich, the experiment will have been worth the while.

Penny-a-Word Telegrams.

We are ever ready to support any movement tending to the public welfare and founded upon the basis of reason and knowledge; and we willingly endorse the claims of Mr. J. Henniker Heaton upon the gratitude of the nation for the reforms connected with the means of communication throughout the British Empire which he has so assiduously advocated and promoted. But we are compelled to assert that in his present efforts to reduce the charge for telegrams between all parts of the Empire to one penny per word, he has committed a gigantic error, foredoomed to absolute failure.

Is it possible that Mr. Heaton has become a convert to the fallacious and mischievous theories of modern Socialism? Does he believe that any benefit can be gained from the adoption of the principle that the State shall pay for everything, forgetting the fact that ere this can be done, some means must be found to pay the State? Or, following in the footsteps of a certain municipal engineer, does he argue that if an extremely low price is charged for a commodity or service, the cost of production will automatically sink still lower?

With the standing example before us of the British Postal Telegraphs, which to this day have remained a burden upon the shoulders of the taxpayer, it seems idle to discuss the feasibility of Mr. Heaton's scheme. If a halfpenny per word cannot be made to pay within an area 500 miles square, densely inhabited by a population most intimately linked together by ties of kinship and commerce, how in the name of common sense can any rational being propose to achieve a commercially successful result at a penny a word over an area practically comprising the whole world, divided up between self-contained communities whose common interests and inter-connections are infinitely less numerous and intimate—by means of cables and lines, moreover, whose cost relatively to their carrying capacity is out of all comparison greater than that of our insular system? The thing is absurd on the face of it.

On the other hand, if Mr. Heaton proposes to make the majority, who don't want to telegraph, pay the bulk of the expenses of the minority who do, he proposes to saddle the taxpayers of the Empire with an annual payment of some three millions sterling at the lowest computation—to begin with. What the sum would amount to in a few years' time cannot be estimated, but it would certainly be enormously greater. Let Mr. Heaton lay his proposals before Mr. Lloyd-George, and see what *he* thinks of them! Mr. Heaton argues that in Australia a penny rate is charged for a range of 3,600 miles—but he omits to point out that the vast majority of the inland telegrams traverse far shorter distances, and that the long-distance telegrams are carried at a loss. A reduction of the Atlantic rate from 1s. to 6d. a word a few years ago only led to an increase of traffic of 10 per cent., while the receipts fell 45 per cent.—and the rate went up again.

It is ridiculous, in any case, to assert that increased traffic, even if it were obtained, would save the situation; the capacity of the cables is limited, and any material increase in the traffic would at once necessitate a corresponding increase in the outlay on cables, with proportionally augmented working expenses. The conditions obtaining in the postal service are totally different, and no analogy can be drawn between the two. The only cable of Imperial importance owned by the nation—the Pacific Cable—at 3s. a word to Australia shows an annual deficit of more than £50,000.

We need not labour the point; the proposition, however well meant, is hopelessly Utopian. The depth of Mr. Heaton's knowledge of the technical aspect of the question may be gauged from the fact that he proposes the adoption of the Pollak-Virag system—through long submarine cables!

The only direction in which we can see any chance of progress of the kind suggested by Mr. Heaton is in that of transmitting telegrams of a domestic nature, not in code, at a reduced charge at times when the cables are practically idle—for instance, when it is night at both ends of the cable. Such messages are not usually of such urgency that they cannot admit of a day's delay.

D

PRACTICAL FAULT LOCALISING ON ELECTRIC SUPPLY NETWORKS.

By E. P. AUSTIN.

Although much has been written on this subject, yet the writer ventures to introduce a merrythought into the soup.

No attempt is made in the following lines to introduce new methods, but a short record is made of some successful attempts at fault localisation on a system that does not enjoy the luxury of a cable testing outfit.

To facilitate the discovery of a faulty distributor, it has been found useful to adopt a complete scheme of procedure which is rigidly followed in case a fault develops, and the following brief history of a particular instance will show the lines on which this scheme is worked.

A network is divided up into five sections, each having its separate feeder, and the whole are interconnected by means of light section fuses. Special detailed plans of each section are kept by the mains staff, showing diagrams of each box, with instructions to disconnect in a prescribed order clearly written on each plan.

When a fault develops on any distributor, the section fuses blow, and the fault is either burnt clear, or else the station fuses blow on the feeder supplying that section. In the case in point, a fault developed during the small hours of the morning, and as the section fuses blew only the affected area was shut down. The mains staff were called up and provided with the plan of the affected district. The feeder was disconnected at the feeder box, a telephone hitched on to the pilot cable to communicate with the works, and the cable tested by switching it on to the hospital bus-bars at about 100 volts, using circuit-breakers set light.

As the feeder tested O.K., the district was divided in halves and each portion tested in turn *via* the feeder, in a similar manner. This process of elimination was carried out until the faulty distributor was discovered and disconnected, leaving the rest of the district to be connected up again.

As soon as possible, the consumers were disconnected preparatory to a localisation test being made. An insulation

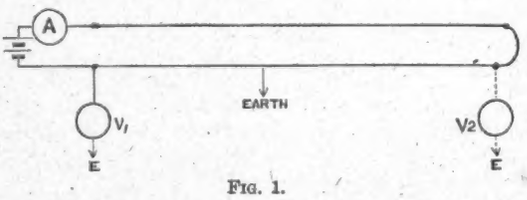


Fig. 1.

test showed that the negative and neutral had both gone to earth, and that the positive was low, but of sufficiently high insulation resistance to hold up against the test pressure of 4 volts.

The test applied was a fall of potential test, and it was decided to treat the negative as the faulty conductor, the positive as a lead and the neutral as the earth.

The diagram, fig. 1, shows the connections for this test, and the formula is—

$$x = \frac{V_1}{V_1 + V_2} l,$$

where x = length in yards from the end V_1 to the fault; V_1 = the voltage at the end first tested; V_2 = the voltage at the far end, and l = the length in yards of the cable.

The writer has found that the fall of potential test is the simplest, and can be carried out with instruments found in any central station, namely, a voltmeter, ammeter, and a 4-volt accumulator capable of sustaining a discharge at the rate of 50 amperes for a short time. The test is applicable under a variety of conditions, and is particularly useful on triple lead-covered cables; its simplicity recommends it, and the apparatus does not require special skill in handling. The voltmeter must, of course, have a finely-divided scale and be of high resistance, otherwise the fault resistance will affect the reading. The test can always be used in the manner described when one conductor is sufficiently insulated to hold up against the test pressure.

It becomes more difficult of application when one or more conductors are disconnected and also earthed (or shorted). Under such conditions the test has been successfully applied in the following manner. The positive and negative of a triple-concentric cable were found to be earthed and also discontinuous; the neutral was earthed but continuous, but held up against 4 volts.

To apply the test the negative was used as the earth, the neutral as the faulty conductor, and a cable was run along the ground from end to end to serve as a lead.

In cases where the conductors are dead earthed and dead shorted, the overlap test can be made with the above-

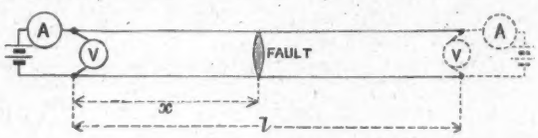


Fig. 2.

described apparatus. Using two conductors and connecting up in the manner shown in fig. 2, the formula—

$$x = \frac{R_1 - R_2 + r_c}{4\, r_y},$$

gives the distance in yards from the end first tested, where R_1 = the resistance between the ends first tested, R_2 = the resistance between the ends tested last, r_c = the resistance of the cables (lead and return), and r_y the resistance per yard of the cable.

If the conductors used are of different areas, then the formula becomes—

$$x = \frac{R_1 - R_2 + l\,(r_{y_1} + r_{y_2})}{2\,(r_{y_1} + r_{y_2})},$$

where l = the length of the cable in yards. The values R_1 and R_2 are calculated from the readings taken at each end, and the values for r_y, r_{y_1} and r_{y_2} can be conveniently obtained from the formula $\frac{\cdot 0435}{A.1{,}760}$ = resistance per yard of a conductor.

These tests can be made with current obtained from the network and used through a bank of lamps or other suitable resistance, but errors are likely to creep in, due to the variation in voltage on the network, which will be particularly pronounced if motors are in use in the immediate vicinity.

In conclusion, it may be remarked that the above-described tests were made on triple-concentric lead-covered cables laid solid, and that in each case the insulation was "good," with the exception of the fault. The degree of accuracy obtained was very close, the faults being found well within the size of the hole it was necessary to make in the ground in order to uncover the cable at the suspected point.

PARLIAMENTARY.

London and District Electric Supply Bill.

(*Continued from page* 825.)

Mr. J. Gwynne, of Messrs. Gwynne, Ltd., said they were large power users, and they took their supply from the Hammersmith Borough Council. If they could get a cheaper supply it would be of very great benefit to them. They paid 1d. per unit for power purposes.

By Mr. Balfour Browne: He was there on the assurance of Mr. Hammond that he would be able to get his supply at a cheap rate.

Tuesday, November 3rd.

Mr. Owen H. Smith, of Hay's Wharf, was called, and spoke as to the financial standing of the other promoters. They were Sir Hugh Bell, Robert Winthrop Blackwell, Robert Sydney Guinness, Robert Miller, George Duncan Rowe, William Dudley Warde, Vincent Woodhouse Yorke, John Young, Sir Edward Tennant, and Lord Fitzwilliam. He considered that £600,000 would be sufficient to enable them to start the scheme. They could not say how the money would be raised or issued to the public. There was no syndicate, and they had made no contracts or agreements. They were perfectly open to accept the best contracts for the construction of the works and the raising of the money.

In answer to Sir Ralph Littler, Witness said they were agreed as to the raising of the £600,000. There was a memorandum amongst the promoters as to the proportion of the costs of raising the money. If they did not think the scheme would be successful, they would naturally not promote it. He thought that if the Bill

passed in a satisfactory state, the promoters would feel in honour bound to proceed with the scheme. They were not bound to go on with the Bill if they did not think it was satisfactory. He did not think the alteration made in the Bill affected the value of it. They had the fullest confidence in Mr. Parshall and Mr. Hammond as engineers to the scheme.

By Mr. Bushe: He did not agree that the alteration of the purchase clause affected the raising of the money.

Cross-examined by Mr. Erskine Pollock, K.C.: There was no memorandum between the promoters as to the raising of the £600,000. The memorandum only had reference to the costs of promotion.

In answer to Mr. Vesey Knox, Witness said the purchase clause at present in the Bill was quite as good as the one originally inserted.

Replying to Mr. Meyer, Witness had not considered the question of the local authorities having an absolute power of veto. He did not know of any local authority which had agreed to take a supply.

Mr. Reed, chief goods manager to the London and North-Western Railway, said that his company had powers to put down a generating plant and work a part of their line by electricity. They, however, after careful consideration, came to the conclusion that it would be an advantage to have the option of taking a supply from a company. No undertaking at present could give them electricity at a price at which would pay the company to take it.

In answer to Mr. Hutchinson (who appears with Mr. Balfour Browne, K.C.), Witness said it did not matter what company they took their supply from, as long as it was cheap and reliable.

Mr. MacFarlane, of Messrs. MacFarlane & Laing, biscuit manufacturers, gave evidence in support of the scheme. Their consumption would be something like 1,000,000 units per annum.

By Mr. Hutchinson: They at present had a steam plant. Mr. Hammond gave him all the facts about the scheme.

Mr. F. Hanbury, of Messrs. Allen & Hanbury, manufacturing chemists and druggists, said he thought the scheme would be of advantage to the small manufacturers to drive their plant by electrical energy. Evidence of a similar character was given by other manufacturers.

A resolution passed by the Erith Urban District Council in support of the Bill was read by Mr. Fitzgerald.

Arising out of a discussion, the Chairman stated that they had no information that a representative of the Board of Trade would appear before the Committee.

This closed the case for the promoters.

Mr. Meyer, representing the Battersea County Council, then proceeded with his opposition to the Bill.

Mr. F. A. Bond, engineer to the Council, was called. He said they obtained their order in 1896. Their output showed a considerable increase during the last few years. The number of units sold for power was, in 1905 6, 400,000; in 1906-7, 460,000; and, in 1907-8, 736,000 units—an increase of 58 per cent., as compared with the previous year. For lighting, the figures were:—1905 6, 1,758,000 units; 1906-7, 1,981,000 units; and for 1907-8, 2,289,608 units, an increase of 15 per cent. as against the previous year. The cost per unit distributed was in 1905-6, ·97d.; 1906-7, ·96d.; and 1907-8, ·65d. They had increased their load factor year by year. In 1905-6 they sold 2,456,000 units, which produced a revenue of £24,579; and for 1907-8 they derived £28,000 from the sale of 3,307,000 units. There had been a decrease in their works costs.

The Chairman remarked that he understood that the Battersea case was that according to the progress made during the past few years there would be no necessity for them to take a supply.

Mr. Meyer said that was so.

Cross-examined by Mr. Fitzgerald, Witness said that Battersea could always generate more cheaply than the promoters could supply them, and accordingly they would go on generating the electricity themselves.

Mr. Meyer then addressed the Committee. He said that Battersea was different from all other local authorities, inasmuch that it was paying back the capital borrowed at the rate of 4·25 per cent. per annum as against 2·07 per cent. per annum, which the other local authorities were paying. They did not care whether the promoters got their Bill, but they did not want them to come in and compete. He asked that a clause should be inserted protecting the Council from the promoters stepping in and giving a supply to the London and South-Western Railway Co. for light at their station at Nine Elms. If they scrapped their plant or combined with the promoters, Battersea would show a loss on their electrical undertaking. He asked that Battersea should be allowed to remain out of the promoters' area.

Mr. Blennerhassett, for the City of Westminster, said they had come to an arrangement with the promoters, and accordingly they did not oppose the Bill. They had agreed on the amendment of the Kitson Clause whereby although they were not at present distributors they would have the same benefits as authorised distributors.

Mr. Cane having presented the case against the Bill for Marylebone, the Committee adjourned.

Wednesday, November 4th.

Mr. Wedderburn proceeded with the case for the Corporation of Croydon.

Mr. A. C. Cramb, engineer to the Corporation, said that the district was primarily an industrial area. They charged 1d. per unit for power, but in the winter months the charge was slightly increased, so as to bring about an average price of 1·14d. per unit. In his opinion whether they scrapped their plant, or took a supply from the promoters, Croydon's undertaking would show a loss.

Cross-examined by Mr. Fitzgerald: They used 2,292,000 units for their own tramways, and 674,000 for public lighting. They were customers to themselves for over half the number of units generated. They wanted to protect themselves against unfair competition.

Mr. Wedderburn, in his address to the Committee, contended that neither by scrapping nor by combination would the scheme of the promoters be of advantage to Croydon. He asked that they should have the power of veto, if the Committee came to the conclusion that Croydon should be included in the company's area. He ventured to submit that the temporary admission of Croydon into the scheme would be fatal to them, for when the L.C.C. took over the undertaking, and London's area had not been enlarged, Croydon would be outside the limits of supply.

Mr. Marten, for West Ham Corporation, called Mr. A. H. Seabrook, electrical engineer to the borough. He stated that their maximum charge for power was 1d. per unit. They had a very large demand for power purposes, and the prices charged had been gradually decreasing. Their station was situated on the Lea and was capable of being extended.

In cross-examination by Mr. Talbot, Witness said that the option of being able to take a bulk supply would do them no harm, provided they were free from the possibility of competition.

Re-examined: He saw no reason why the Corporation should not supply power to railways for haulage, but there were legal difficulties in the way. They supplied railways with current for light and power.

Mr. H. E. Blain, tramway manager of the Corporation, also gave evidence, and explained that the two main roads from Barking passed through West Ham, and those roads were already full up with mains.

Addressing the Committee, Mr. Marten claimed that West Ham was exercising its powers, having due regard to the interests of the public, for the supply of energy for power purposes. At present they were supplying over one-half the power requirements of the borough, and if they went on at their present rate of progress the other half would soon be supplied. A more unfair competition than that proposed by the Bill it was impossible to conceive. They had a commercial undertaking proposing to compete with a local authority. The company could pick and choose—they had not the obligations to fulfil that a local authority had. He asked that they should have an absolute power of veto. He would, however, make one exception, and that was in the case of energy supplied to railways "for haulage and traction, and for lighting on such vehicles hauled." The Bill was a miserable attempt to solve the problem of the electric supply to London, and the power of the L.C.C. to be the purchasing authority made it even worse.

Mr. Bryceson, town clerk of Woolwich Borough Council, said that when they started to supply electricity, they had to buy out the Woolwich District Electric Co. for £8,000 before they could supply in that company's area. They supplied at a 1d. flat rate current for power purposes where the load-factor was 15 per cent. or more. Out of a total requirement of 2,000 H.P., they supplied 900 H.P. They had powers to take a supply from East Ham, but the price was such that it would not allow of a profit. West Ham's mains came within 100 yards of their boundaries, and if they had the power to link up they would be able to supply North Woolwich.

Cross-examined by Mr. Fitzgerald: He did not think that the Borough Council would refuse to take a supply if they could get it cheaply. Their objection was on the ground of competition.

Mr. Courthorpe Munroe addressed the Committee, and said that as regarded Woolwich, even admitting that they were in a bad position, that was no reason why a company should be allowed to come in and compete with them, and so make matters worse. Speaking for St. Pancras and Shoreditch Borough Councils, Mr. Munroe said they could not strengthen the Kitson Clause more than by either giving them the power of veto, or excluding them from the promoters' area. Assuming that the prices in the Bill were applicable to persons as well as authorised distributors, he claimed that his two Councils had been and were doing more than was proposed under the scheme.

Mr. Sydney W. Baynes, chief electrical engineer to St. Pancras, was called, and corroborated Counsel's statement.

Friday, November 6th.

Mr. Balfour Browne, K.C., in opening the case for the companies, said that the Bill seemed to him a wild cat scheme. He would not say that if the scheme had been introduced long ago it would not have been a good project for London. The promoters wanted to supply authorised distributors and such customers as they could steal from the companies, but such a company could not be a success. The Newcastle Co., to which reference had been made, was not only a power company but a distributing undertaking. The existing companies had tried for years to give a supply for lighting, heating and power purposes. They had sunk £20,000,000 of capital in their undertakings, and it was absurd to think that by the spending of £6,000,000, the problem of the electricity supply of London would be solved. They had six large stations, and each of them could be turned into a peak load station if the Bill which would come before that Committee was passed. It had been stated that there was a large field for power untouched, but in 1906 a great canvass was made. It was then found that the companies were supplying 46 per cent. of the total power requirements and the local authorities 35 per cent. Was it right that the existing undertakers should be disturbed for the sake of putting money into the pockets of a few gentlemen who wished to exploit London? The companies had been reducing their prices year by year, but if the Bill was passed, they would have two concerns competing for the load factor, with the result that down would go the load factor and up would go the price. He contended

that the statement of Mr. Parshall that a saving would be effected to London of £640,000 was fallacious, and could not be borne out by the facts. The promoters had estimated that they could save five of the London companies—Charing Cross, County of London, London Electric, City of London and the South Metropolitan—an annual sum of £30,000, but they made it a loss of £35,000. They hoped to effect a greater saving to London of ¼d. per unit under the new *régime* of being able to link up the stations. Passing to the financial aspect of the Bill, Mr. Balfour Browne said that, although their own Kitson Clause had gone, the clause giving them their money back was gone, Sir Hugh Bell had said he was satisfied with the Bill. He (counsel) knew the explanation of that—the promoters wanted a Bill. The company was not bound to go on with the scheme at all, if the promoters did not think it was satisfactory. By the passing of that Bill, the electricity development of the present undertakers would be put an end to. How could they cheapen electricity as the promoters stated? Under the scheme two profits had to be made—one for the promoters, and one for the authorised distributor. If electricity could be cheapened, he submitted that it could be done by letting the companies link up. The passing of that Bill would not give a cheap supply, but would place an incubus on London. The gentlemen who brought the scheme forward were virgins in finance, and he asked the Committee to say as was said to the virgins of old, "Too late, too late, you cannot enter here."

Mr. H. B. Renwick, secretary of the County of London Electric Supply Co., corroborated counsel's statement. Witness put in tables showing that the total supply by his company to 1,923 industries for power purposes was 30,137 H.P., giving an average of 15·7 H.P. each. In 1900 they supplied 478,440 units for power purposes, and in 1907 they sold 7,060,482; an increase of 2,339,687 units over the preceding year. They had spent more than a million and a half in capital charges. With a view to encouraging the use of energy for power purposes, the company charged a flat rate of ¾d. per unit between 9 p.m. and 7 a.m. They had quoted as low as ·45d. per unit. Their average price for power in 1903 was 2·7d., and in 1907 1·39d. They had spent no less than £70,000 in purchasing consumers' old plant. In his experience the field for this scheme did not exist, and there was no justification for the spending of another £6,000,000 to compete with the existing undertakings.

Cross-examined: They had been reducing their prices for power since 1896, when they first began to supply for that purpose. They made their canvass to show that Mr. Merz's figures which he put forward before the 1906 Committee were wrong. He objected to the assumption that a power supply in relation to energy supplied for lighting was a by-product. Theirs was a competitive area in some parts. Although in some cases there were two competing companies, it was light against light and not light against power.

Re-examined, Witness said that all the companies in his area were purchasable in 1931. There was no consumer in his district who could not get a supply on reasonable terms. His company had put on between 5,000 and 6,000 H.P. to their undertaking since 1906.

Mr. A. F. Harrison, secretary of the City of London Electric Lighting Co., said that the company's capital expenditure was over £2,000,000, and last year the gross receipts from all sources were £280,860. Their average rate of dividend since 1891 till 1907 was 4·45 per cent. In 1900 they supplied 448 customers with 1,239 KW., at an average rate per unit of 2·49d. Last year they had 2,033 customers, to whom they supplied 12,499 KW. at 1·42d. per unit. In 1900 they supplied 534,771 units for all purposes, excluding traction, as compared with 6,084,055 last year. In their company's area at the end of March, 1908, they supplied 13,388 H.P., as compared with the other companies who were supplying 6,511 H.P. in the district. Of the total power demand in their area they supplied over 77 per cent. They had no reason to doubt the honesty and integrity of the canvassers who carried out the canvass.

Mr. C. P. Sparks, chief engineer to the County of London Electric Lighting Co., said that he had studied the question of the electric supply of London for several years. In his opinion railways would preferably put up their own generating works rather than take a supply from an independent company, as it gave them greater security of control. All the tramways were at present well supplied by existing undertakers, and the field in that direction for the promoters was very limited.—The Committee adjourned.

Tuesday, November 10th.

Mr. C. P. Sparks, continuing his evidence, said that the assumption of the promoters as to the number of unsupplied horse-power was erroneous. The average number of units supplied to 1 H.P. was 500 for industrial purposes. He considered that the estimate of the promoters of £200,000 for distributing cables was totally inaccurate. He did not believe it could be done at such a low figure. The existing 13 companies covered two-thirds of the supply to the Metropolis. Four of the companies' stations were situated on the river, at Bankside, with a capacity of 24,800 KW.; Wandsworth, 8,500 KW.; Deptford, 17,250 KW.; and Blackwall, 6,000 KW. Most of the stations only covered one-third of their sites. Several of the other stations were capable of obtaining sea-borne coal. He did not suppose that the promoters would ever obtain the business of the large undertakers. The cost of extending the present stations of companies would work out at £12 per KW., and they could provide the mains as well at £23 10s., as against the promoters' estimate of £32 per KW. He did not agree with the figure put in as to the diversity factor. The promoters could not generate cheaply enough for the authorised undertakers to take a supply. The County of London Co. had been reducing their working costs. The costs of generation, including capital charges, for that company in 1902 were 1·86, and in 1907, ·95. That company was not an isolated instance; all the companies had been reducing their costs. It was reasonable to suppose that the lower operating costs under the promoters' scheme would be outweighed by the increased capital costs in the distribution. The diversity factor of the promoters was estimated at 1·5 and 1·6, but he gave it as 1·1. In his opinion the only way to ensure reliability of supply was by alternative mains. He did not agree with the promoters' scheme of a central station for supplying the whole of London. The only way to get cheap electricity and reliability of supply was to allow the companies to link up their stations. In order to get the benefit as estimated by the promoters, there would have to be an increase of 80 per cent. in the requirements of consumers, and even then it would only mean a saving of one-eighth of a penny per unit. Before the estimate of the promoters that they could save the companies £29,000 could be correct, they would have to reduce their estimated prices by 33⅓ per cent.

Cross-examined by Mr. Talbot: There were three sub-stations in the City and two in the West End. They were not large, but they had to remember that fact in considering whether the companies would take a bulk supply. To generate 23½ million units would cost £89,962. In 1907 the capital charges of his company were £3,263, equal to 6½ per cent. All his figures were based on actual knowledge, and not on estimates. He did not anticipate that in the companies' scheme there would be transmission—each district would be supplied from its own station. He admitted that to generate on a large scale would bring about economies in certain directions, but he thought they would be outweighed by the increased costs of transmission and distribution. The problem of the electricity supply to London could be solved if, instead of small companies working in isolated districts, they all worked together. Although the companies' Bill had been altered by the Lords' Committee, he thought it could still be carried out. The fact of the Joint Committee Clause having been thrown out did not affect the Bill from an engineering point of view.

In answer to the Chairman, Witness contended that the promoters would have to spend £2,000,000 for what the companies under their Bill could do for £1,000,000.

Continuing, Mr. Sparks said that it might pay the smaller distributors to take a supply from a bulk company, but certainly not the large undertakings, and therefore they could not get a large business. Two of the companies' stations would have to have cooling towers, but he admitted that was not economical. He thought turbines were the right things to use at the present moment, but, in his opinion, in a few years' time they would be superseded by large gas engines. They would not make an agreement, such as they did with Mr. Merz, with the promoters, or any other similar company. The conditions of things had altogether changed.

Re-examined: He thought it would be injudicious for such a company as was proposed to be embarked upon, on the mere speculative assumption of the railways taking a supply. The whole difference between Mr. Hammond and himself was that he had relied on vague and insufficient estimates, and he (the witness) on actual experience.

Replying to the Chairman, Witness said that his company had applied three times for powers to link up their station, but had not succeeded. That was the only reason why the companies had not linked up.

Mr. J. S. Highfield, chief engineer to the Metropolitan Electric Supply Co., said that in his view it would be commercially unprofitable for the promoters to try to supply probable consumers. He thought the present authorised distributors were able to cope with the demand. If the promoters were allowed to proceed, at some distant date London would have to pay for a double set of mains. The area of proposed supply was already covered with a network of mains. Assuming that one-half of the unsupplied field in London could be obtained, he thought 23,000 KW. would be able to give that additional supply If the companies were allowed to link up, there would be a surplus of 35,000 KW. If the existing restrictions were removed so that authorised distributors could link up, there would be a natural tendency to use the present resources of the undertakers, thereby doing away with the need for spending large sums of money in putting down new works. The powers of competition would be destructive to the scheme. The metallic-filament lamp would limit the increase in the supply. The introduction of that lamp tended to increase the amount of spare plant. There was no immediate demand for such a large station as was proposed under the scheme. Experiments were being made with oil engines; he did not think, however, that they would be so economical as gas engines. If these gas engines became permanently adopted, he thought it would nullify such a scheme as they were now considering.—The Committee adjourned.

Foreign Tramway Rails.—In the House of Commons last week a member wanted to know what amount of rails for tramway purposes had been imported into this country from Belgium and other countries in each of the last three years; also the cost of such rails, and the average cost of similar rails manufactured in the United Kingdom. The President of the Board of Trade, in reply, said, according to the *Times*, that the imports of rails for tramway purposes were not recorded separately from the imports of other rails prior to 1907. In that year 1,362 tons of tramway rails, of a declared value of £8,766, were consigned to this country from Belgium, and 2,509 tons, of a declared value of £18,046, from other countries. He had no official information as to the average cost of tramway rails manufactured in the United Kingdom. In the same year, 4,077 tons of tramway rails of British manufacture, valued at £69,284, were exported from the United Kingdom.

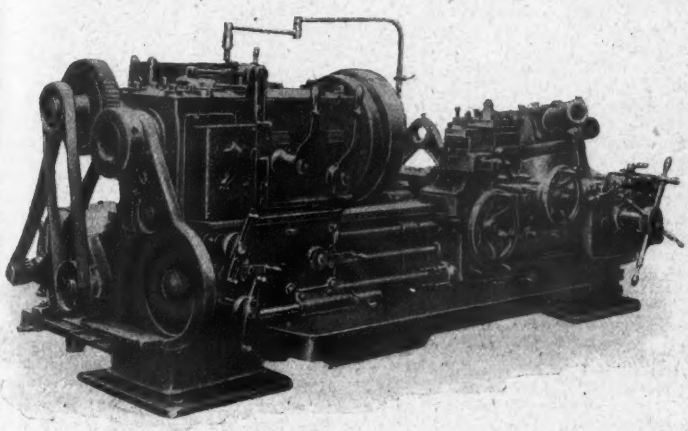
NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Turret Lathe with Motor Drive.

A Manchester exhibit, which we have not previously referred to, was that of H. W. Ward & Co., Ltd., machine tool makers. On this stand was shown a 12-in. inclined turret lathe with an all-gear head, driven by means of a chain drive from an electric motor. Sixteen changes of speed in geometric progression are obtainable by operating one or other of the three levers on the head, and only those gear wheels actually being driven are in mesh. The gears are steel, machine cut, and run in oil.

The spindle is hollow, bored 5¼ in. in diameter; the saddle has automatic sliding, surfacing and screw-cutting motions, driven through a change-gear box under the headstock; and the turret—hexagonal in form—is carried on an independent saddle and provided with improved tool holders.

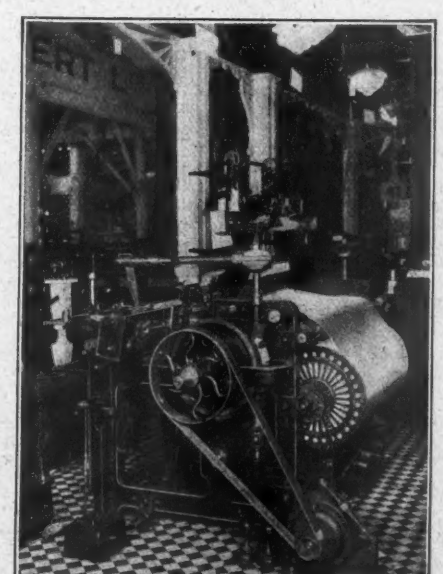
Both turret and saddle have 12 independent feeds. A 24-in. diameter three-jaw self-centring chuck, a rotary oil pump, tools, tool holders, &c., are provided with the lathe.



Ward 12-in. Electrically-Driven Turret Lathe.

An Electrically-driven Loom.

Through the courtesy of Messrs. Siemens Bros. Dynamo Works, we are able to illustrate the calico loom shown in operation on their stand at Manchester Exhibition. This, it will be remembered, was driven by a ½-h.p. Siemens 400-volt 50-cycle three-phase motor, shown in the foreground, and operated quite satisfactorily at some 218 r.p.m., as against the normal loom speed of 198 r.p.m., thus giving a considerably increased output, an advantage which was, we understand, supplemented in this case by a much improved fabric.

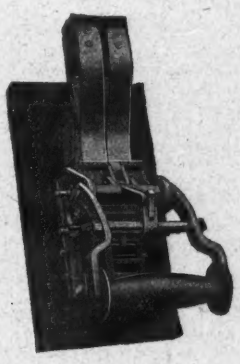


Calico Loom Driven by ½-h.p. Siemens Motor at the Manchester Exhibition.

New Circuit-breaker.

The Switchgear Co., Ltd., of Newhall Street, Birmingham, have recently placed upon the market a form of circuit-breaker, known as Model "E," which embodies several new features in construction. The circuit-breaker is closed by a pull-down motion, the power being transmitted through a carefully designed toggle movement; the brush presses downwards on to the top surface of the upper contact, and upwards on to the underneath surface of the lower contact. The brush is of the laminated pattern, and has auxiliary copper and carbon breaks.

The tripping of these circuit-breakers is effected by means of a push button in the end of the handle in the case of small breakers, which are provided with straight handles. Larger sizes of this pattern of circuit-breaker are provided with handles of the reel type, carried by a stirrup, which enables the operator to obtain a much better grip of the operating handle, and in such breakers the tripping is effected by means of a push button situated in a position suitable for easy operation by means of the thumb while the handle is gripped.



Switchgear Co.'s Model "E" 3,000-amp. Circuit-Breaker.

A special feature is the ease with which the circuit-breaker is closed, especially in the case of the heavy types; the 3,000-ampere size can be very easily closed by one hand, owing to the special toggle movement and long leverage.

With this model, as with all the Switchgear Co.'s circuit-breakers, a free handle is provided, and it is arranged for fitting with the well-known Statter patent time lag if required. For reverse current or no-load operation, Model "E" circuit-breakers are fitted with the Sugden & Rodway patent reverse movement, the most important features of which are that its action is independent of bus-bar pressure, and that it will operate even with a sudden heavy reverse current such as would be produced by an attempt to switch in a standing generator. These circuit-breakers are made in all sizes from 50 to 3,000 amperes, and in all combinations as single, two, or three-pole, with overload, reverse or no-volt features for d.c. or a.c. work up to 600 volts. The illustration is of the 3,000-ampere size with reverse current movement.

Cutting Out Metal Sheet.

The machine described below is specially constructed to cut out metal sheets into any desired shape, such as templates, sweeping boards for foundries, and all kinds of curved shapes required in every-day shop practice. It is not a machine for repetition work, such work being more suitably done by means of special dies and punches, but it is essentially a machine to replace the hammer and chisel work, which, up to now, has been necessary when only one or two pieces of a similar shape have been required.

The No. 1 machine, which we illustrate (p. 836), has a gap of 12 in., and is suitable for plates up to ¼ in. thick. The No. 2 machine has a gap of 24 in., and is suitable for plates up to ½ in. thick.

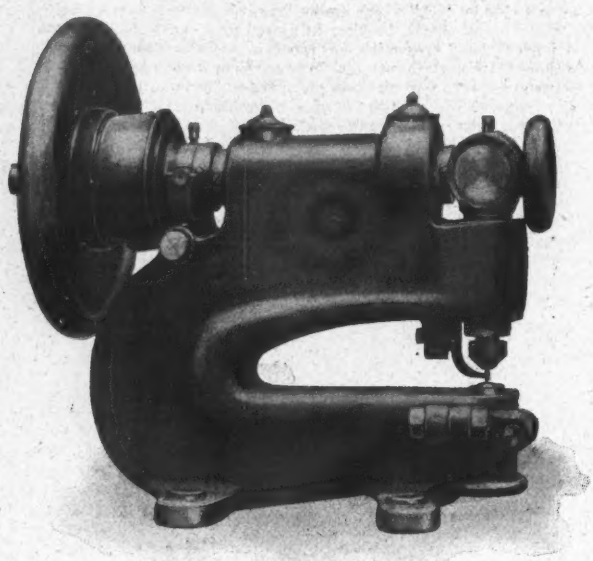
The machine runs at a high speed, 300 revolutions for the No. 1 machine, and 250 for the No. 2, and is furnished with a punch of a special shape, as shown in the adjoining sketch; the cutting edge of the tool is in front, and the back of the punch is prolonged to act as a stay. The cutting edge can be set in any direction to suit the work.

Punch and Die.

The stroke of the machine is slightly greater than the thickness of the piece to be cut, and the movement is obtained by a special eccentric motion. The end or tail of the punch works in a die which is placed in the anvil of the machine just below the punch, and the tail of the latter is long enough to work up and down in this die throughout the stroke, so that it affords a very efficient stay for the punch.

The die can be lowered by means of a screw to enable the operator to pass a sheet of metal under the punch, so that he may begin to cut in a hole in the middle of the plate.

The chips produced are of crescent shape; the groove left by the punch acts as a guide, and the operator has simply to place the plate under the punch and turn it slightly, while pushing it, in the direction of the arrow to obtain any desired shape. After a few minutes' practice, a boy can cut out on this machine to a mark, any shape, so closely that a smooth file will finish the work.



Machine for Cutting Out Sheet Metal.

The machine is made by the Societe Anonyme des Etablissements Ph. Bonvillain & E. Ronceray, 9 and 11, Rue des Envierges, 17 and 19, Villa Faucheur, Paris.

Portable Rheostats for Meter Testing.

With a view to facilitating the testing of meters *in situ*, which necessitates the provision of a steady load of sufficient magnitude to enable the test to be done with rapidity, Messrs. Wm. Geipel and Co., of Vulcan Works, St. Thomas Street, S.E., are introducing a series of portable rheostats specially arranged for this purpose.

The rheostats consist of a number of resistance units of the well-known Ward-Leonard pattern, each one being of suitable capacity for connecting directly across the line pressure; these units are enclosed in a metal case, as shown in the illustration. The load is adjusted to suit the test by switching in one or more of the resistance units by means of the knife switches provided for the purpose; 20 different loads can thus be made by equal increments, each switch being marked with the corresponding number of amperes. The apparatus can be supplied in various sizes from 10 to 50 amperes, for use on all pressures between 100 and 250 volts.

Portable Meter Testing Rheostat.

The rheostats are light, small and of convenient shape for portability; for example, a 20-ampere, 100-volt rheostat weighs 13 lb., and measures 5 in. × 12 in. × 9 in. The case is furnished with eyelets, which can be attached to straps for carrying.

New Model Lampholders.

Following up their recent success with the "Automat," the Metallic Seamless Tube Co., Ltd., of Wiggin Street, Birmingham, have introduced a cheaper pattern of lampholder, the "New Model." In this type there are only two holes through the porcelain base, and there is no metal whatever at the back of the base, the terminals being secured by expanding the metal into a seating. Wiring is rendered extremely easy, the fixing screws are very accessible, with large holes for the wires, and the metal parts do not come near the case. The dome is lined with insulating material, so that the wires cannot possibly come into contact with the metal case. The design is certainly novel and worthy of notice.

LEGAL.

The Affairs of the North Metropolitan Tramways.

In the Chancery Division on Saturday, Mr. George H. Devonshire applied, before Mr. Justice Neville, for an order for reduction of capital on a petition by the North Metropolitan Tramways Co. By extraordinary resolution, counsel said, the company decided to reduce its paid-up share capital by payments to and distribution amongst the shareholders, also any capital in excess of the wants of the company; no such resolution, however, could come into operation until confirmed by the High Courts. There had been two previous reductions of capital, in 1897 and last year. The company was incorporated under an Act dated 1869 and subsequent Acts, and capital had been issued to the amount of £1,109,230 in 110,923 shares of £10 each. The company acquired or constructed tramways in the counties of London, Middlesex, and Essex, and in 1897 it sold its London tramways to the L.C.C., taking out a lease for working the system under the Council in the same year. In 1906 it surrendered the lease and all its London property to the Council again for a considerable sum of money, and out of the money thus received the company last year effected a reduction of capital. The Middlesex tramways were sold to the Metropolitan Electric Tramways Co., Ltd., subject to debentures which had been raised, amounting to £51,700, the limited company undertaking to pay these debentures. There was a sum on deposit at Parr's Bank equal to the amount of the debentures, and last year, when the reduction was sanctioned, the company gave an undertaking that it would not apply the money except for the payment of these debentures. They would fall due on January 1st of next year, and so as to that sum there was no question. The Essex tramways were running in East and West Ham, and they had all been sold to local authorities. The only assets the company had in its hands which remained unrealised were the freehold works at Leyton, a depôt in East Ham, and some stables in West Ham. The company had capital in excess of its wants amounting to £15,600, and the amount of the reduction contemplated, if the order of the Court were obtained, was £11,092, leaving a balance of £4,515.

An interlocutory order was made.

Attempt to Defraud a Tramway Company.

Before the Hon. Sheriff Motherwell, at Airdrie, a father and son, belonging to Hamilton, were charged with having, on August 24th, within the office of the Airdrie and Coatbridge Tramway Co., Ltd., formed a felonious conspiracy to defraud that company by pretending that the younger accused had been travelling on a tramcar in Coatbridge, that the car had been suddenly brought to a standstill by the driver, and that the son had been thrown against the controller of the car and received injuries to his back and ribs, for which pretended injuries both accused contended that the company were liable in damages. Accused both pleaded guilty, the father being sent to prison for 30 days, while the son was put on probation.

BUSINESS NOTES.

Consular Notes. — Switzerland. — The Austro-Hungarian Consul at Zurich reports that the electrical industry of Switzerland was kept fully occupied during the year 1907, and was in a satisfactory condition. The number of firms engaged in the industry was 41, with a total capital of 84,000,000 fr. The industry employed 10,500 hands in 1906, and the production was valued at 37,000,000 fr. One of the most important Swiss electrical firms specialises in the single-phase system for use on railways, with satisfactory results. Over 500,000 H.P. is estimated to be in use in Switzerland. Although, as stated, the condition of the industry was satisfactory, development has not been so great as formerly owing to the high price of raw material, and coal and increased wage rates. The most important metals, iron copper, lead, tin, and zinc, reached a

price which has rarely, if ever, been known before. But by May, 1907, the price began to fall quickly, and the electrical industry was, after that, in a more advantageous position. The extension in the utilisation of electricity for lighting and power purposes in Switzerland, as well as in other countries, has created a growing demand for electrical materials, and particularly was this the case in Italy, Spain, Russia, Egypt, and South America. The increasing utilisation of electricity on railways and tramways has also favourably influenced the industry, and now that electric traction on the Simplon railway has been proved to be altogether satisfactory, it may safely be anticipated that great developments will be witnessed in this direction in the course of the future. It has been decided to install electric traction on the Burgdorf-Thun railway, the Langental-Jura railway, and the Seebach-Wettingen railway, the two former by the firm Brown, Boveri & Co., and the last by the Maschinenfabrik Oerlikon. It has also been decided to install electric traction on the Seetal railway. Electrical motors were greatly in demand for mining and metal works; steam turbines for vessels were also greatly in demand.

Turkey.—The Austrian Consul at Jerusalem reports that a fair business is being done there in petroleum, steam, and wind motors, and it is anticipated, now that the prohibition of importation has been removed, that a good trade will be done in electric motors. Every year new industrial undertakings are being established, and the demand for motors of this description is increasing.

Japan.—The Austrian Consul at Yokohama, in a recent report, states that in recent years, and particularly since the Russo-Japanese War, the Japanese have been making efforts to free themselves from their dependence on foreign products, and have, therefore, been rapidly developing home industries. This has caused an increased demand for foreign machinery, instruments, and tools, which was shown in the figures of importation in 1907. In the year 1906 the imports of these goods were valued at 27,040,544 yen, but in 1907 they had increased to a value of 40,850,340 yen, or an increase of more than 12,000,000 yen. The value of locomotives imported in 1907 was 1,712,001 yen, as against 1,382,703 yen in 1906, these imports being almost exclusively from the United States, with small consignments from Great Britain and Germany. Railway passenger carriages and goods wagons were imported to a value of 1,021,513 yen, of which more than half came from Great Britain, and the remainder from the United States. The importation in this class has decreased since the Japanese railway carriage works have begun to produce; only small appurtenances such as wheels, axles, springs, brakes, &c., are imported by them. Parts for electrical carriages have shown an increase in importation. In 1907 the value was 558,532 yen, as compared with 305,752 yen in 1906; of the imports in 1907, 478,034 yen came from the United States, and the remainder from Germany and Great Britain. Electrical machines (dynamos, motors, &c.) were imported in 1907 to the value of 2,542,937 yen, as against 1,811,495 yen in 1906. This increase of more than 500,000 yen was caused by the development of the electrical industry and the construction of electric railways. Of the total imports in this class in 1907, 1,526,874 yen, or more than half, were from the United States, 700,000 yen from Great Britain, and 300,000 yen from France. The imports of steam engines also showed an increase, being valued at 1,350,168 yen in 1907, as against 883,398 yen in 1906. The trade is mostly in the hands of British and American manufacturers, although French houses do a small business. The imports of steam turbines showed a very large increase; the value in 1906 was only 129,812 yen, but in 1907 it rose to 1,005,967 yen, of which two-thirds came from Great Britain and the remainder from the United States. Steam boilers were imported to a value of 1,464,229 yen in 1907, as against 1,238,361 yen in 1906; the imports are almost exclusively from Great Britain and the United States. Gas, petroleum and hot-air engines were imported to a value of 548,477 yen in 1907, as against 218,092 yen in 1906, the imports being mostly from Great Britain. Electric wire importations were valued at 2,462,712 yen, Great Britain, Germany, the United States and France sharing the trade. The importation of rails showed an increase of more than 1,500,000 yen, the imports in 1907 being valued at 3,828,502 yen, as against 2,216,102 yen in 1906. The advantage gained by Germany in previous years was maintained, the remainder of the trade falling to the United States, Great Britain and Belgium.

Later in his report, the Consul states that in 1907 there were in all, in Japan, 16 electric tramway companies, with a total authorised capital of 77,824,673 yen, of which 47,200,665 yen are paid up. The length of line in working is 272 miles. The number of carriages is 1,372, as against 1,253 in 1906. In the year under review (1907), the total number of passengers carried was 182,389,707, about 21,000,000 more than in 1906. Comparing the number of passengers carried on the tramways and the number carried on the railways, it appears that the electric tramways carried about 56,000,000 more passengers than the railways. The gross takings of the electric tramways in 1907 amounted to 7,657,774 yen, and the expenses to 3,616,344 yen. The net receipts were, therefore, 4,130,593 yen. The largest profits were made by the Tokio Railway Co., which paid a dividend of 11½ per cent. The Tokio-Yokohama Railway also paid a dividend of 11½ per cent., and the Osaka Kobe Electric Tramway Co. paid a dividend of 12 per cent. Other companies paid dividends varying from 2 per cent. to 9½ per cent. In 1907 the construction of several other electric tramways with a total length of line of 163 English miles, was taken in hand.

The number of telegraph offices in existence in Japan was 2,815, and the number of telephone offices 421. The number of telegrams dispatched was 24,413,965, and the number of telephone messages, 159,414,115.

Russia.—The British Vice-Consul at Kieff, in a recent report, states that British-made oil engines for use either with kerosene or crude oil, are again finding an outlet in that district. The principal competitors are German and Swedish made engines, and copies of Swedish and American engines made in Poland. The principal buyers are peasants, and the engines are chiefly used for driving small flour mills.

The British Vice-Consul at Nicolaieff reports that during the course of the year 1907 the installation of electric light throughout that port was completed. Negotiations have been begun between the town and the concessionaire company concerning the electrification of the existing horse tramway system.

China.—The British Consul at Swatow reports that the dispute between the Swatow Electric Light Co. and the contractors having been satisfactorily settled by arbitration, the installation was worked for some weeks. Before the expiry of the four months during which the working of the plant was to be tested before the final payment was made to the contractors, one set of the machinery was rendered useless by a leak in the roof, and a few days later the duplicate set was damaged by lightning. The damaged plant was sent to Hong Kong for repairs, and it was not until March 3rd, 1908, that the company resumed working.

Brazil.—The British Consul at Pernambuco, in a recent report, states that the ever-increasing commercial competition with which British trade has to reckon, would seem to necessitate new departures of enterprise if British commercial supremacy is to be increased or even maintained; one is impressed with the desirability of a more extended personal acquaintance on the part of principals of firms with the markets to which they export, more particularly in the case of countries such as Brazil, where local conditions are so totally different from any conception that could be formed of them by persons residing in the United Kingdom. Modern progress has made travelling so easy, cheap and agreeable, that there are now no serious obstacles in the way of partners of enterprising firms, who wish to visit personally the countries and districts with which they trade, or in which they desire to extend their operations, and thus become familiarised with the tastes and requirements of their customers. In regard to the methods of foreign competitors with which the British exporter has to contend, the Consul states that a representative of a German electrical firm fitted an installation of electric lights and accumulators on a carriage of one of the suburban railways at Pernambuco free of charge, to show the advantages of his firm's special system, with a view to orders.

Panama.—The British Consul at Colon reports that the Colon Electric Light and Ice Co. was established in 1905. The plant is capable of supplying 1,200 incandescent lights of 16-c.p., and the ice plant is of 10 tons' capacity. The Canal Commission have their own electric light and ice plant. A De Forest wireless telegraph station has been erected, and is under the control of the United States Navy Department; under favourable atmospheric conditions communication is said to have been made with Guantanamo, Cuba.

The Consul states that the list of imports shows that there are many commodities in which the British Empire is not represented as well as it should be, and the attention of manufacturers is specially invited, amongst other articles, to electrical apparatus, iron piping, machinery, tools, wire fencing, &c. If, states the report, the commercial agents who periodically visit this Republic could arrange to combine in their business transactions some of the articles in the list, instead of confining orders to a limited class of goods, it would swell the total of imports from the United Kingdom and increase the profits of their travels.

Annual Dinner.—Mr. David Maxwell, of Messrs. Maxwell, Son & Co., electrical engineers, presided at the annual dinner to the employés recently. It was stated that the staff were working at top speed. Mr. James Lockhart, junior partner, replying to the toast of the firm, said that they had never more work in hand than at present. They hoped to devise a scheme whereby the employés would participate in the profits of business they brought to the firm.

Receiver Appointed.—Mr. A. G. Mellors, of 1, King John's Chambers, Bridlesmith Gate, Nottingham, has been appointed receiver on behalf of the debenture-holders in Cutler, Wardle and Co., Ltd., electrical engineers and metal workers, Dickinson Street and Hargreaves Road, Manchester.

The Rating of Ignition Accumulators.—Owing to the somewhat irregular system of rating the capacity of ignition accumulators which has for some time prevailed in the automobile trade, the question was recently taken up by the Tire and Accessory Committee of the Society of Motor Manufacturers and Traders, which has just reported that "the capacity which is stated as ignition capacity" can have no actual value, as the accumulator when working on ignition is used intermittently, under varying conditions of speed, and at various discharge rates of current, and that no figure giving the capacity of an accumulator is of practical value unless the discharge rate is also stated. As a result of the inquiry, the following rules are recommended for ignition accumulator rating:—

1. Accumulators shall have printed on their labels their actual capacity when discharged at a definite rate continuously, this rate being one-twentieth of the capacity claimed. An interval of rest to be allowed, such interval not to take place until half the period of discharge has expired.

2. The accumulators can have printed on their labels the approxi-

mate capacity with intermittent current, which shall be arrived at by doubling the actual capacity, obtained by following Rule 1.

3. In cases of dispute on the subject of the actual capacity of an accumulator, such dispute may be referred to the S.M.M.T., who may order tests carried out on the basis of Rule 1 by some competent authority, such as the Electrical Standardising and Training Institute, Faraday House, London.

The Society will permit all manufacturers who agree to these conditions to mark on their labels above the capacity values, the words "S.M.M.T. Rating," and all accumulators bearing labels with such marks on are understood to be subject to the above test in case of dispute. The wording on the label should be as follows:—

Capacity	S.M.M.T. Rating.
Actual capacity at constant discharge	Ampere-hours.
Approx. capacity with intermittent current.....	Ampere-hours.

Tramcar Brakes: The Report Issued.—The report of the Special Committee on "Braking Arrangements and Sanding Gear on Tramcars" has now been issued in the September number of the *Journal* of the Tramways and Light Railways Association. Copies can be obtained at 10s. 6d. each from the Secretary of the Association, 35, Parliament Street, London, S.W.

Catalogues and Lists.—Messrs. A. Reyrolle and Co., Ltd., Hebburn-on-Tyne.—Several new publications; No. 52, containing an exhaustive description, with diagrams, of the Merz-Price protective gear; No. 72, consisting of an illustrated account of the firm's ironclad H.T. switchgear; and No. 76, an illustrated article (reprinted) concerning their switchgear in mines.

British Thomson-Houston Co., Ltd., Rugby.—16 pp. pamphlet, giving particulars, illustrations, and prices, of their various electric heating and cooking devices. Also a card with an amusing picture in colours of representatives of the four peoples of the British Isles singing together the praises of the B.T.-H.-Edison tungsten lamps. On the reverse side of this card, is a list of firms' addresses in London where the lamps can be obtained.

Messrs. Nilmelior (England), Ltd., 36 and 37, Alfred Place, Tottenham Court Road, W.C.—48 pp. catalogue giving prices and illustrations of coils, magnetos, commutators, sparking plugs, switches and voltmeters. Wiring diagrams for magnetos are included, also a table of prices of spare parts.

Messrs. Heenan & Froude, Ltd., Worcester Engineering Works, Worcester.—New catalogue, No. 20, wherein appears an account, fully illustrated and with diagrams, of the Heenan and Schiele blast and exhaust fans.

Messrs. Mavor & Coulson, Ltd., 47, King Street, Mile End, Glasgow.—November date card on the reverse side of which appear some particulars and a diagram of a Pick-Quick coal-cutter operating under tender coal and broken roof.

Messrs. C. J. Thursfield & Co., 28, Berners Street, London, W., and Birmingham.—From this firm we have received a portfolio of examples of electric light fittings made by them to harmonise with the panelled room, and also some decorations of the 17th and 18th centuries. The pictures represent the fittings on a one-sixth scale, and many of them we easily recognise as being quite new designs. A price list of these fittings in old brass, bronze, gilt-colour, polished brass, or antique copper, finish accompanies the prints.

Birmingham Carbon Works, Witton, Birmingham, and 46, Queen Victoria Street, E.C. (Exclusive selling agents: The General Electric Co., Ltd., 71, Queen Victoria Street, E.C.).—Leaflet, drawing attention to their metal cored flame carbons, of which large stocks are held.

Messrs. Premier Electric Control, Ltd., Premier Works, Red Lion Street, Clerkenwell, E.C.—New and fully illustrated catalogue, containing descriptions and tabulated price particulars of their various manufactures, including some new patterns. The firm's standard motor-starters are followed by starter regulators, reversing starting switches, drum controllers, three-phase starting switches for induction motors, auto-transformer starting switches, universal motor control panels, switches, fuses, power boards, and high tension oil switches and other manufactures. Dimensional drawings appear in a number of cases, and altogether the lists forming this catalogue are very well produced.

Book Notices.—*Alternating Currents Simply Explained.* By A. W. Marshall. London: Percival Marshall & Co. Price 6d. net.—We welcome this little book, which is written for those—mainly amateurs—who understand continuous currents and want to know something about alternating currents. We welcome it because it is a sign of the growing interest in electrical subjects, due no doubt to the increasing use of electricity for all purposes, and because alternating currents, which cannot be generated by primary batteries, have hitherto remained beyond the reach of the average amateur. There is no method to compare with the experimental method for acquiring correct ideas on physical phenomena—particularly electrical, and above all alternating-current, phenomena. The author deals with his subject in the most elementary and popular style, without any mathematics at all; in the first 15 pages he touches upon alternation, inductance, lag and lead, skin effect, anti rotary fields! He then explains the action of an alternator, and goes on to discuss the measurement of alternating currents, the properties of transformers and choking coils, and A.C. motors, winding up with rotary converters and rectifiers. We cannot help feeling that the amateur, with no technical tutor, will find this little work a fairly hard nut to crack; but that will do him good.

The Architects' Directory (Travellers' Edition) 1908. London: Jas. Truscott & Son, Ltd. 5s. net.—This is a pocket edition, edited by Mr. A. C. Freeman, convenient in size and shape for the use of travellers who may be calling upon architects in any part of the country. The first 36 pages contain an alphabetical list of London architects, those residing in the provinces following in order of county. All of the entries are corrected up to last month.

The Young Model Maker. Design No. 1. London: The *Model Engineer*. Price 1s. net.—This is the first of a series of designs for models of engineering apparatus in cardboard, this being a Midland Railway locomotive. Besides the cards, printed in the correct colours, there are wooden steam dome, valve chest and chimney, wooden axles, wire hand-rail, &c., and a book of instructions. Engineers who have youngsters desirous of following in their footsteps will find this a most acceptable present to a boy.

The Static Transformer. Hayes, Middlesex: The British Electric Transformer Co., Ltd.—This book, although largely a trade publication, differs so widely from the ordinary run, that we feel that it ought to be regarded rather as a technical publication. We have long held that the study of trade catalogues was a most profitable and instructive occupation; this work is in no sense a catalogue; neither is the matter of the text-book order—it is the excellent illustrations that command our interested attention, for they lay before the reader in detail the whole process of building a Berry transformer. Apart from the particular design adopted, which in itself is of great interest, the public revelation of a manufacturer's methods is so rare an event that we are sure the book will be welcomed by electrical men. The matter also is of interest, as it contains numerous hints, based upon extended experience, upon the essential features of successful transformer design; for instance, the importance of bending mica only in one plane, and with a large radius of curvature; the necessity of winding all the coils as tightly as possible; and the folly of carrying out either manufacture or repairs without employing highly-skilled workmen, are amongst the points emphasised. We congratulate the company on this unique production.

Annuaire pour l'An, 1909. Paris: Gauthier-Villars. Price 1 fr. 50 c.—The *Annuaire* this year is devoted mainly to astronomical information and data, including special articles on "The Variable Stars," by M. Bijourdan, and "Movements of the Earth's Crust," by M. Lallemand.

"Unités Electriques." By Le Comte de Baillehache. Paris: Dunod & Pinat. 1909. Price 6 fr.

"Engineering Science." By Chas. F. Jenkin. Oxford: Clarendon Press. 1908. Price 1s. net.

"Fortschritte der Elektrotechnic." 1907. Vol. 4. Edited by Dr. K. Strecker. Berlin: 1908. Price M. 15.

"Proceedings of the American Society of Civil Engineers"; October, 1908. Vol. 34, No. 8. New York: The Society.

"Description et Utilisation de la Méthode pour la Mesure des constants de Ligne au Moyen du Barretter." By Béla Gati. Buda-Pesth: From the Author.

"Thoughts on Natural Philosophy." By A. Biddlecombe. Third edition. Newcastle-on-Tyne: R. Ward & Sons.

"Journal of the American Society of Mechanical Engineers," containing papers to be presented at the December meeting. Vol. 30, No. 9. Baltimore: The Society. Price $1.

"Electrical Laboratory Course for Junior Students." By R. D. Archibald and R. Rankin. London: Blackie & Son. 1908. Price 1s. 6d. net.

"Dynamo, Motor and Switchboard Circuits." By W. R. Bowker. London: Crosby Lockwood & Son. 1908. Price 7s. 6d. net.

"Transformers." By G. Kapp. London: Whittaker & Co. 1908. Price 10s. 6d. net.

Commercial Intelligence published a special birthday number last week, in celebration of the completion of its 10 years of publication.

Bankruptcy Proceedings.—W. T. Garnett, electric cable and wire manufacturer, Bradford.—November 19th is the last day for the receipt of proofs for intended dividend by Mr. E. Musgrave, 1, Bank Street, Bradford.

Cuba: Duty on Wire Reduced.—The Board of Trade are in receipt, through the Foreign Office, of a copy of a Decree of the Provisional Governor of Cuba, dated October 5th, reducing the Customs duty on wire and cables for the transmission of electricity, protected by lead tubes and other insulating covers, from $7·50 to $2 per 100 kilogs.—*Board of Trade Journal.*

Dissolutions and Liquidations.—X Electric Accumulator Co., Ltd.—This company is winding up voluntarily, with Mr. W. J. Webb, 18, Leadenhall Street, E.C., as liquidator, at a fee of 225 guineas, to whom particulars of debts, &c., should be sent. A meeting of creditors is to be held at 85, Gracechurch Street, on November 18th.

Hemsley, Ord & Co., electrical engineers, 37, South Sherwood Street, Nottingham.—Messrs. V. C. Hemsley & R. Ord have dissolved partnership. Mr. R. Ord attends to debts, and will carry on the business as Richard Ord & Co.

H. N. Morris & Co., Gorton Brook Chemical Works, Manchester.—Messrs. H. N. Morris and J. L. Rose, chemical manufacturers, have dissolved partnership. Mr. Morris will attend to debts and continue the business under the same style.

Trade Announcements.—The Foster Arc Lamp and Engineering Co., Ltd., owing to the increased demand for their small transformers, and the necessity for having them in stock for immediate delivery, have now trebled their machinery and equipment for manufacturing these. The insulating, assembling, and testing departments all contain modern labour-saving tools and

appliances. For the transformers the makers claim sound construction, excellent voltage regulation, low core losses, and a capacity to take large overloads without injury.

Mr. Arthur Snell has purchased the business and patents of Messrs. R. H. Edgar, Ltd., to whom he has recently been manager. He has entered into partnership with Mr. H. Tinsley, electrical engineer, of Beckenham, manufacturer of standard testing instruments and Weston cadmium cells, who takes all his plant and sets of standards into the new firm. The name of the latter will be SNELL & TINSLEY, telegraph and electrical engineers, Stanley House, Eldon Park, South Norwood, S.E.

MESSRS. COOKSON & Co., have removed from Endell Street, Long Acre, to Albion House, 59-61, New Oxford Street, W.C. Their telephone number and telegraphic address remain unaltered. They notify that, in addition to their business as electrical engineers, they make a speciality of supplying accumulator accessories, and are also the London agents for the Rapid Magnetting Machine Co., of Birmingham, one of whose magnetic separators they have on view at Albion House, 59, New Oxford Street, W.C.

THE EBURITE PAPER CO., LTD., of Dane Street, High Holborn, W.C., have recently put down special machinery for manufacturing cartons in which to pack metal-filament lamps.

THE BRITISH ELECTRIC CALIBRATED FUSE CO., of Harpenden, having just installed a new plant of presses, the output of which at present exceeds their own demand, are open to undertake any class of press work, in order to keep their plant running at full pressure.

Industries on the North-Eastern Railway.—We have received from Mr. H. D. Dryden, the commercial agent of the North-Eastern Railway, an advance copy of the new issue of the "Directory of Manufacturers, Wholesale Importers, and Exporters on the North-Eastern Railway System." There are some 27,000 entries altogether, so that the book contains more than double the amount of matter given in the first edition. The addresses of colliery-owners, coke manufacturers, coal exporters, and ship-owners have also now been included, and telephone numbers are given. Additional trades have been added, and in several cases important industries like chemical and iron manufactures have been split up into classified sub-headings. An index to trades shows very strikingly what a variety of industries are carried on in the N.-E. Railway area. The book is distributed gratis among traders whose names appear in it, and it will also have a large circulation in other parts of the country and abroad. Any of our readers who may be interested in the matter can secure a copy of the book by applying to Mr. Dryden at the office of the Chief Goods Manager, Commercial Agency, North-Eastern Railway, York.

Flame Arc Lamps.—We have received the following letter from the BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., LTD.:—

"With reference to the statement made by Messrs. J. & H. Grevener in the advertising columns of your last issue, to the effect that their "Arcoflame" lamps are no infringement of the Bremer-Westinghouse patent, we beg to state that proceedings were instituted by us on July 22nd last, and are now pending, against this firm in respect of infringement of British Patent No. 18,786* of 1902, in the name of Hugo Bremer, for improvements in electric arc lamps, of which patent we are the proprietors. As, consequently, the matter is now *sub judice*, we refrain from any comment on the statement referred to."

We have also received from MESSRS. J. & H. GREVENER a notice to the effect that their "Arcoflame" lamps are not an infringement of the "Bremer-Westinghouse" patents. This was stated by them in their advertisement of last week. As the matter is *sub judice*, we do not propose to refer to it again until the case is heard.

LIGHTING and POWER NOTES.

Bath.—The T.C. has agreed to extend the time of completion of the transfer of the electricity undertaking from October 31st to December 31st, 1908. This is necessary owing to the delay of the B. of T. in sanctioning the arrangement. It is suggested that it may be necessary to obtain Parliamentary sanction in case the Board refuses to give a decision: the Corporation is pledged to support Mr. Schenk in an application to Parliament if required.

Belfast.—The Harbour Commissioners, before taking any further steps in connection with the proposed use of electricity for pumping at the Hamilton graving dock, are consulting Messrs. Preece & Cardew as to a visit to the place. A portion of the plans provides for a combined pumping and power station.

Bo'ness, N.B.—Such progress has been made in this town since the power station was opened in 1905, and especially during the last 12 months, that an extension became inevitable, and a new 300-KW. generator was started up on the 4th inst., by the National Electric Construction Co., who run the station on behalf of the Council. The number of lamps connected is now over 22,000.

Burslem.—The T.C. has received from the L.G.B. sanction to a loan of £10,094 for electricity purposes.

Canada.—For many years past overhead wires have been condemned by the business interests of Montreal, and many efforts have been made by the city to abolish them, and to compel all companies to put them in underground conduits. The question of the ownership of the latter has been the cause of much discussion, ownership by the city being deemed most advisable. Eventually, a committee of experts was appointed by the City Council to report upon the matter. The Montreal Street Railway claimed that it was under no obligation to place its wires in a municipal conduit; the Montreal Light, Heat and Power Co. declined to reply, but claimed that it had the power to run a conduit parallel to the proposed civic one at any time. The city is going to secure power from the Legislature to compel the different companies to act in unison with it.

The Lighting Committee of the city has recommended the following offer to be made to the Montreal Light, Heat and Power Co. for public lighting for the next 10 years:—Arc lamps, each, per year, $60; incandescent, 64 C.P., $10; and 32 C.P., $15 each. For lighting municipal buildings, &c., by meter, for incandescent and arc lighting, 9 cents per KW.-hour for the energy used. The company asked about 25 per cent. more.

The erection of an electric plant, centrally situated along the Harbour front, is the latest scheme upon which the chief engineer of the Montreal Harbour Commissioners is working. The idea is to supply from this plant all the energy required for every purpose in connection with the Harbour property.

The T.C. of Cobourg, Ont., has passed a by-law authorising the renewal of the contract with the Cobourg Utilities Corporation for the supply of light to the town. The light contract has been generally modified in favour of consumers.

The Port Arthur (Ont.) T.C. has arranged a supply contract with the Keministiquia Power Co., to take 400 H.P. for 10 years at $25 per H.P. per annum. The company will build a sub-station with a capacity of 3,000 H.P.

Continental Notes.—AUSTRIA.—The absorption by the Union Bank of Vienna of the undertaking of the International Electricity Co., of that city, of which transaction particulars were given in this journal a short time ago, is explained in the recently issued report of the directors of the bank. It is mentioned that the bank established the electrical company, has served as its financial institution, and has been largely interested in it, holding a considerable number of shares. By the sale to the Vienna Municipality of the Vienna central station and the receipt of the purchase price, the company was confronted with the question of a material transformation. An examination of all possibilities led to the conclusion that, under the altered circumstances, the company was not in a position to offer to its shareholders such a yield as would approach the dividends paid in recent years. The report proceeds to state that the electrical industry is seeking for new spheres of activity and is devoting itself largely to undertakings which bear the character of financial operations. Some time ago the bank, in association with the company, approached the question of the electrification of railways, and negotiations with the State railways were entered upon in regard to the conversion of main lines to electric traction. By means of the amalgamation with the company, the bank acquires the services of experts for the existing and future electrical enterprises, and a double charge upon the portfolio department is thereby avoided, whilst on both sides the expenses incidental to the independence of the undertakings are saved, and no costly machinery has to be put in operation in the case of increases in capital.

According to the *Financial Times*, some English, French and Hungarian capitalists have combined to build a big electrical power station at Fiume, with a capacity of 36,000 H.P., which is to supply Abbazia, Fiume, and the Dalmatian towns with electric power and light. The installation will cost £1,000,000,

ITALY.—Application has been made to the authorities of the Province of Florence for permission to put down a plant to utilise the water-power of the River Lima, at Piteglio, in the generation of electrical energy for lighting and power purposes.

GERMANY.—A hydro-electric scheme, at an estimated cost of about M. 2,000,000, has been devised for the supply of light and power to Brackenheim and the townships within a radius of 50 km. The works include the erection of a dam on the River Ens, whereby power to the extent of 1,200 H.P. will be made available. The plans are now under the consideration of the Ministry of the Interior.

A company with a capital of M. 2,500,000 is in course of formation at Regensburg, with a view to supplying light and power to the town and neighbouring districts.

Darlington.—A proposal to utilise a trolley wire on the tramway overhead lines with a pressure of 250 volts to supply energy to the new schools at Harrowgate Hill and the Co-operative premises was considered by the T.C. on November 3rd. The proposal was objected to, and by the casting vote of the Mayor the matter was referred to the Electricity Committee for further consideration.

Egham.—In order to demonstrate the advantages of its new scheme—referred to in these columns a short time ago—the Egham Electric Lighting Co. has taken an untenanted house in the High Street and provided a complete installation of electric light for the public to inspect. Should this new enterprise prove successful, the company proposes erecting a generating station between Staines and Egham.

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Fulbourn.—The question of lighting the asylum has been deferred for fresh tenders to be submitted by the Cambridge Electric Supply Co. and Cambridge Gas Co.

Glasgow.—It was reported by the treasurer to the Electricity Committee that he had borrowed from the Corporation's Loan Fund the sum of £10,000 for capital purposes, making the total amount borrowed for these purposes up to date, £1,810,000. With reference to a remit regarding the application to be made to the Secretary for Scotland for consent to borrow a further sum to meet additional expenditure for electricity purposes, the engineer reported:—(1) That a sum of £56,500 would be required for new buildings and machinery; and (2) that a sum of £75,840, at least, would be required for mains, cables and meters for new consumers' premises. The treasurer further reported that the amount which the Corporation (electricity department) had obtained authority to borrow was £1,850,000, and that he estimated that at November 30th next, the borrowing powers of the department would have been exhausted. The sub-committee, after consideration, agreed to recommend that application be made to the Secretary for Scotland, in terms of the Electric Lighting (Scotland) Act, 1902, for his consent to a further sum of £150,000 being borrowed for electricity purposes.

The special Sub-Committee on the extension of Port Dundas station, now report that the works there should not be further extended as a generating station, and that the vacant ground there should be utilised for the erection of a building at a cost of £9,000 to £10,000, the front portion to be used as a store, and the rear section as an extension of the boiler house. The engineer has been authorised to prepare drawings, and the town clerk to advertise for tenders.

London.—Marylebone.—The B.C. has agreed to the recommendation by the Electricity Committee, which appeared in our last issue, and which was to the effect that the whole of the streets in which electric mains had been laid should be lighted by electricity instead of by gas. A sub-committee of five was appointed to bring up a report on the whole matter to the Council at an early date, in order that the work may be executed by March next.

Hampstead.—The Lighting Committee of the B.C. has had under consideration the advisability of converting 100 incandescent street gas lamps in the borough to electrical metallic-filament lamps. The Committee is carrying out experiments in various roads, but at present is not satisfied that the proposed change would be advantageous to the Council. Consideration of the matter was deferred until the next meeting.

Kensington.—The B.C. recently sent a circular letter to the other B.C.'s asking their support in urging the L.C.C. to insert in a General Powers Bill a clause giving power to incur reasonable expenditure in attending electrical and other technical conferences. Of the 28 Metropolitan B.C.'s, 10 were in favour, 6 were against, 10 decided to take no action, while 2 had not passed any resolution on the matter. These facts were communicated to the L.C.C., which, in the absence of any general desire on the part of the Metropolitan B.C.'s, is not going to take any action in the matter.

L.C.C.—The presentation of the weekly cash paper at Tuesday's meeting of the Council, led to an unseemly squabble in respect of one item for Parliamentary expenses in connection with the London and District Electricity Supply Bill. Mr. A. W. Claremont, who raised the subject, ventured to hint that although the B. of T. had recommended the insertion of a purchase clause in the Bill, the Council's Parliamentary Committee had given instructions which sought to defeat this object. As the speaker was debarred by the Standing Orders from discussing the general question, he moved that the Council should adjourn as a protest against the alleged action of the Committee and the lack of any report on the matter. A motion for adjournment only entitles the mover to address the Council for five minutes, the seconder (in this case Sir J. W. Benn) merely to second, and the Chairman of the Committee concerned to reply in five minutes, at the end of which the motion must be put and decided one way or another. Mr. W. Hayes Fisher, chairman of the Finance Committee, who presented the cash paper, remarked that he knew nothing of the point raised, and although Mr. J. M. Cassell, chairman of the Parliamentary Committee, succeeded in stating that he did not altogether agree with the observations of Mr. Claremont, he was equally as unsuccessful as the Hon. W. Peel in endeavouring to obtain a hearing in view of the Standing Orders already mentioned. In the circumstances the motion was put to the meeting and carried by a slight majority on a show of hands. A division was claimed by the Progressives, who engineered the movement, but the motion was defeated by 59 votes to 32, and the Council, after, half an hour's storm, then proceeded to the next business.

Loughborough.—A L.G.B. inquiry was recently held into an application by the T.C. to borrow £2,500 for electrical extensions. Attention was drawn to the working loss on the undertaking; and it was pointed out that the loan was for excess expenditure and for 200 additional services which were necessary in order to fully utilise the Council's plant. Mr. John F. Snell has been retained to investigate the working of the undertaking.

Oswestry.—The E.L. and Power Co. has from January 1st, 1909, reduced the price of electricity for lighting from 6d. to 5½d. per unit, and for heating, cooking and power to 2d. per unit up to 250 units per quarter; 1½d. from 250 to 500; 1d. from 500 to 25,000; ¾d. from 25,000 to 50,000; and ½d. per unit beyond.

Perth.—The Electricity Committee is considering a proposal to introduce penny-in-the-slot meters in connection with electric supply to small consumers.

Spalding.—The B. of T. has asked the U.D.C. what steps are being taken to carry out the E.L. Order, 1905, before deciding whether the order shall be revoked. It is suggested that an extension of time be applied for, and with this in view the matter has been referred to the Gas Committee.

Turton (Lancs.).—At a meeting of the U.D.C., held on the 5th inst., it was decided that application should be made to the B. of T. before December 21st, 1908, for a provisional order for electric lighting.

Tynemouth.—On the 6th inst. Mr. H. R. Hooper resumed the L.G.B. inquiry, opened on February 6th, 1907, regarding the raising of capital in connection with the Corporation electric light undertaking. It was desired to borrow £1,088, which had been over-expended upon buildings, and £3,163 over-expended upon the laying of mains. The Inspector said that up to March last the Corporation possessed borrowing powers to the amount of £97,297, and the expenditure had reached £91,556. That left a balance in round figures of £5,740, which was practically a cash balance. He would like the Corporation to start with a clean sheet as from April 1st, and he would recommend the setting aside of £2,000 of the balance referred to for mains, being the amount estimated to meet the requirements for the next three years, and £1,100 for house services. That would leave a balance of £2,640. He suggested that the Corporation should apply to the L.G.B. for the cancellation of its borrowing powers to that extent.

Walsall.—The Electricity Committee has resolved to charge firms taking electric current for the purpose of illuminated signs at motor rates, provided they agree to keep the sign illuminated until midnight on six nights a week and pay for the cost of renting a separate meter.

Watford.—The U.D.C. is applying for further powers in connection with its electric lighting undertaking, as to extension of area, supply of fittings, free wiring, &c.

Wolverhampton.—From the annual report of the Corporation Electricity Committee, issued last week, we extract the following statement of units sold during the year ended June 30th, 1908:—

	Lighting.	Power.	Traction.	Total
June 30th, 1908...	1,265,527	2,108,472	1,563,272	4,937,271
Corresponding period last year	1,127,095	1,403,000	1,578,176	4,108,271
Increase	138,432	705,472	Dec. 4,904	829,000
Increase	12·2 %	50 %	—	20 %

The report also states: "The Electric Construction Co., Ltd., being desirous of obtaining a supply of current to their works at Bushbury, which are situate outside the area of supply of the Corporation, negotiations are in progress with the Midland Electric Corporation for Power Distribution, Ltd. (who, possessing statutory authority to supply Bushbury, have given their consent to the proposed arrangement), for the supply, in bulk, of energy to them by this Corporation with the object of ultimately affording a supply to the former, as required."

Yarmouth.—At a meeting of the T.C. on Tuesday last week, the town clerk was instructed to make application to the L.B.G. for sanction to borrow £2,000 for carrying on the work of laying public lighting mains in connection with the electricity undertaking. It is recommended that 100 lamps should be connected per year, at a cost of £200 out of revenue, the balance for mains and standards to be paid out of loan. Since March last 58 lamps have been fixed at a cost of £140 to revenue, and £418 to loan account.

TRAMWAY and RAILWAY NOTES.

Birmingham.—A tramway collision occurred at Gravelly Hill on the morning of the 9th inst. A dense fog prevailed at the time; both cars were badly damaged, but the passengers fortunately escaped injury.

Continental Notes.—Germany.—The net profits realised by a number of electric tramway companies in Germany in the financial year 1907-8 were on the average higher than in the preceding 12 months. According to the *Arbeitsmarkt Correspondenz*, 53 companies representing a share capital of £16,368,000, obtained net profits regarded as a whole and after deducting the losses of individual undertakings, amounting to £1,417,500 in 1907-8, or about 9 per cent. of the share capital, these figures comparing with £1,285,000 and 8 per cent. in the previous year. A total loss of £675,000 was incurred by five of the tramways included in the 53 undertakings. The dividends paid were not increased to the same extent as the net profits, as the reserve funds were more liberally endowed than in 1906-7, and various companies which earned higher profits only distributed the same percentage dividends as in the former year.

The position of the enterprises was approximately as follows in the two years:—

	1907-8.	1906-7.
Total amount distributed in dividends	£1,059,500	£1,048,000
Dividend percentage	6·5	6·4
Dividend percentage of 20 companies	2 to 5	—
" " 23 "	5 to 10	—
" " 3 "	over 10 per cent.	—
No. of non-dividend-paying tramways	7	—

The largest tramways in Berlin paid the same dividend in 1907-8 as in the preceding year, whilst the smaller undertakings yielded an increase on the average. The policy of not raising the rates of distribution, notwithstanding the higher profits, was also followed in the case of the tramways in the large provincial cities.

A report has been issued by the Berlin State Railway authorities on the subject of the catastrophe which took place on the so-called triangle section of the Berlin Elevated and Underground Railway on September 26th. It is stated that the working conditions are so obvious that the accident would not have happened if the driver and guard had exercised a moderate degree of attention. This is shown, according to the report, by the circumstance that since the opening of the railway 2,500,000 trains, carrying over 220,000,000 passengers, have travelled over the triangle section without hindrance. The State Railway authorities submit that, as a result of the accident, measures should be taken to increase the degree of control and assist the driver in observing the signals. At the same time, it is intended to make an experiment with automatic safety appliances. The reduced speed which has been prescribed for certain parts of the route is to be continuously supervised by special electrical appliances. The guard is at present able to bring the emergency brake into operation and to short-circuit the current in case of danger. It is ordered that trials should be made with automatic brakes, which, if found to be sufficiently reliable, will be permanently used on the triangle section. The railway company has posted notices asking passengers not to converse with the guards during the time the trains are in motion.

It has been decided to employ electric motor carriages on the State railways in the Köln district, each carriage affording seating accommodation for 100 persons. Altogether the Prussian State Railways have 57 accumulator carriages on order, of which a third are to be divided between the districts of Köln, Frankfort, Saarbrücken and Erfurt. The first of these has just made a trial run near Berlin, and has given every satisfaction.

The Baden Ducal Railway Administration has decided to electrify the railway lines connecting Schopfheim with Basle and Zell, in Switzerland. It is intended to employ the single-phase A.C. system at 10,000 volts and 15 cycles. The current for working the railway will be generated at a hydro-electric station to be built near Augst-Wyhlen on the Rhine. Three-phase current will be produced and transformed into single-phase at a sub-station to be built in Basle. The line is to be worked by locomotives of 1,000 H.P., and orders for 10 have been placed with German makers.

TURKEY.—A group of French bankers has assured the future of the Constantinople tramways. Funds have been subscribed to put the old lines and rolling stock in perfect order, construct new lines and ultimately convert the whole to electric traction.

FRANCE.—A concession has been granted to M. Ménebielle for the creation of a network of departmental electrical tramways, including a line from Lourdes to Bagnères and Grip. A 90 years' concession has also been granted to the same gentleman by the Municipal Councils of Bagnères, Campan and Cieutat, for the construction and working of an electric railway and funiculaire to the summit of the Pic du Midi de Bigorre, a height of 2,877 m.

HONG KONG.—Application has been made by an Italian to the Government for permission to construct an electric tramway from Victoria, passing by a tunnel under the peak to the district to the south, where ample space exists for the establishment of a new town, which, being exposed to many winds, will be free from the heavy and depressing temperature of Victoria. The concession is likely to be granted, as it is supported by the local Press and by all those suffering from the existing unhealthy conditions.

Derby.—The Corporation tramways made a net profit of £4,804 during the last financial year, a figure some £3,126 below that of the preceding year. The decreased profits are ascribed to the disorganisation during conversion of three routes during the year, from horse to electric traction. Some 12½ miles of route and 47 cars are now in operation on the system, which carried 8,775,686 passengers during the year.

Fleetwood.—The L.G.B. auditor has surcharged the District Council with the sum of £150, which was paid into the fund for the purpose of enabling the Thornton Council to appeal in the case of the tramroad rating appeal.

Folkestone.—The T.C. has received a letter from the National Electric Construction Co. relative to the proposed tramways, and pointing out that it would be impossible to finance a surface-contact system with present knowledge of the working of such systems. The company asked for an interview, and it was ultimately decided to reply, asking what points were to be discussed.

Hanwell.—Colonel Yorke, of the B. of T., has inspected the tramway track in the district as a result of complaints as to noise. He pointed out that the Board could not compel the company to relay the track, and the only question was whether the track constituted a public danger to ordinary traffic, which, in his opinion, it did not. He proposes to make another inspection in about a month's time.

Glasgow.—All matters between the Glasgow and Clydebank T.Cs. having been adjusted, the process of linking up the tramway lines within the latter's jurisdiction has been completed. It is reported that negotiations are in progress with the county directors so that passengers on Glasgow Corporation cars will be carried on to the burgh terminus with the one ticket.

Heywood.—The Finance and Tramways Committee has instructed the town clerk to take the necessary steps to obtain a Parliamentary Bill to secure mutual powers for the running of the electric cars in the towns of Heywood, Bury and Rochdale.

Hull.—At a meeting of the Corporation Tramways Committee last week, it was decided to obtain tenders for a new feeder cable for Spring Bank at a cost of £1,300 to £1,400. Discussion followed as to the trackless trolley system, and it was stated that both Manchester and Dundee had the system under consideration, that it would be a good system for the Stoneferry route, and that probably it would be tried there.

Huyton.—The U.D.C. has refused its consent to the Liverpool Corporation for the construction of a tramway within the District Council's area, from the Broadgreen boundary, through Roby, to terminate at the Archway Road, Huyton.

Kirkcaldy.—A Committee of the T.C. has been appointed to consider proposals to extend the tramways to Dysart and other places. The trackless trolley system is also being considered.

Kirkintilloch.—The T.C. has appointed a deputation to confer with the Glasgow T.C. on the matter of extending the tramways to the town. The Glasgow system at present reaches Bishopbriggs, and the proposed extension would lengthen the route by about three miles.

London.—In connection with the fire which occurred on the Metropolitan Railway at Swiss Cottage Station on October 6th, a report has been issued by Major Pringle, of the B. of T., in which he states that failure to obey the company's rules, and the proximity of a lighted lamp to some naphtha cans in the guard's van, were responsible for the fire. Major Pringle also draws attention to certain points, among which are the fact that greater use could have been made of non-inflammable woodwork and materials in the construction of both trains and platforms.

L.C.C.—The Highways Committee has asked for authority to expend £25,900 for the construction of the authorised tramways in Streatham High Road from the present terminus to the county boundary at Norbury, and for the reconstruction of the lines in a portion of Woolwich Road. It is proposed to carry out the track work by the direct employment of labour. An expenditure of £2,100 for the provision of ploughs for an additional 175 cars is to be incurred.

The Council has decided to arrange for a deputation to wait upon the Prime Minister, to urge the necessity of securing the immediate establishment of a London traffic board on the lines of the report of the Royal Commission on London Traffic.

Salford.—In order to avoid further litigation, negotiations are proceeding between the Salford and Eccles Tramway Committees for the running of the South Lancashire cars between Worsley Court House and Parrin Lane, Winton, so that there shall be no overlapping. The tramway between the latter point and Alder Forest, Worsley, belongs to the Eccles Corporation.

Stretford.—At a special meeting of the Council held last week, it was decided to raise the Manchester Tramways Committee's assessment from £2,192 to £4,106 and another assessment connected with the same Committee from £347 to £587.

Torquay.—At a meeting of the U.D.C. on Wednesday last week, the town clerk read a letter from the National Electric Construction Co. asking for consent to extend the tramways to Paington. It was stated, *inter alia*, that the extended portion of the system would be on the overhead principle. The communication was referred to the Tramway Committee.

Wolverhampton.—In the annual report of the Corporation Tramways Committee presented to the Town Council on Monday, reference is made to the cost of track repairs. It is there stated that for the year ended December 31st, 1905, the average cost of repairing the track, per mile, was £18 3s.; for the year ended December 31st, 1906, the cost of similar work was £21 19s.; and for the same period of 1907, £28 11s. For the present year it is estimated the cost will be slightly more, and the Committee states that, of course, as years proceed, this cost is certain to increase. The following is a statement of traffic recipts, &c., for the first six months of this financial year, ended September 30th last, as compared with the same period last year:—

Electric cars.	Miles.	Passengers.	Receipts.	R.P.C.M.
1908	496,073	4,814,268	£22,533	10·901
1907	495,114	4,931,409	£23,067	11·182
Motor-omnibuses.	**Miles.**	**Passengers.**	**Receipts.**	**R.P.C.M.**
1908	28,015	283,778	£1,368	11·726
1907	28,883	272,110	£1,302	10·824

From the above figures it will be observed that the total revenue of electric cars, for the period mentioned, shows a decrease of £534 2s., the receipts per car-mile have decreased by ·281d., whilst 117,141 less passengers have been carried.

TELEGRAPH and TELEPHONE NOTES.

Ceylon.—The telegraphic system of the Island of Ceylon grew in 1907 by 81 km. of line and 292 km. of wire to 2,743 km. of line and 5,878 km. of wire; 415 interruptions occurred, the duration of which was 2,876 hours, these figures being practically the same as those of the previous year. Nine new telegraph offices were opened during the year, the total number of offices open being 108. The total number of telegrams dealt with during 1907 was 807,996, against 759,671 in 1906 There were 602,039 inland telegrams; 118,109 were dispatched to India and other countries, while 87,848 were received from them, these all making the total above shown. The increase over 1906 was 48,325 telegrams. The receipts of the telegraph service were £47,817, and the expenses were £33,095, leaving a balance of £14,722. As far as the telephone service was concerned, there were 62 private lines, 20 official and 50 railway lines. There were 267 subscribers in Colombo. The system comprised 72 km. of line on poles, and the line 1,145 km. Receipts were £1,701.—*Journal Télégraphique.*

China.—The Chinese Administration announces the opening of telegraph offices at Yungtung in the province of Kwantung, and at Anpingting in the province of Yunnan.

France.—The Société des Téléphones et Télégraphes de Lyon has been formed at Lyons with a share capital of £32,000 for the working of the German patents of the Mix & Genest Co.

Rhodesia.—The *Journal Télégraphique* publishes extracts from the report of the Postmaster-General of Southern Rhodesia on the telegraphs and telephones in that Colony for 1907. Of telegraph lines there were in Southern Rhodesia 3,647 km. of line and 6,696 of wire, while in the Bechuanaland Protectorate there were 947 km. of line and 2,893 of wire. The Government constructed a line 39 km. in length on iron poles between Insiza station and Myati, and was also erecting a line between Blinkwater and Felixburg, 38 km. in length. The telegraphic traffic in 1907 amounted to 575,300 telegrams, of which 205,246 were sent, 203,132 received, and 166,922 passed in transit. The latter decreased by 3.076 as compared with 1906, while the former two increased by 2,334 telegrams. Of the tolls paid for ordinary and Press telegrams Southern Rhodesia took £13,625, other African administrations £1,839, and the cable companies were paid £7,186. On the three classes of telegrams before mentioned, Southern Rhodesia netted £13,625 on telegrams sent; £706 on telegrams in transit, while on those received £6,176 was collected. Besides this £1,000 was received by way of subsidy from Bechuanaland, on account of half rates charged on Government telegrams £1,742 was collected. The number of offices open in 1907 was 82, of which 16 were in Bechuanaland. Of employés, there were 103 whites and 125 coloured.

The number of telephone subscribers at Bulawayo is said to have considerably increased. A line exists between Umtali and Penhalonga, and an extension has been made of the Westane Junction-Mat pos Terminus Hotel line to the Matopos Dam Hotel. 80 km. of line and the necessary apparatus have been lent to persons and companies operating the Veracity, Gothic and Shamrock Mines for the purpose of erecting a telephonic communication with Gwelo. The revenue from the telephone service was £3,992. From January 1st to December 31st, 1907, the receipts from the telegraph and telephone services were £27,723; the expenses were £23,827, leaving a balance to the good of £3,896.

Siam.—A cable, manufactured at Singapore, has been laid between the outer anchorage at Kohsichang and Bangkok. —*Board of Trade Journal.*

Telegraph Convention.—The Emperor Menelik has signified his desire that Ethiopia shall be admitted as an adherent to the International Telegraph Convention of St. Petersburg of July, 1875. The new German Cable Co. formed to lay cables between Germany and Brazil *via* Teneriffe, will announce its adhesion to this Convention during the summer of next year.

Telegraphic Interruptions.—

Port Arthur-Chifu	... ...	March 9, 1904
Cotonou-Grand Bassam	... ...	Oct. 29, 1908
Zanzibar-Mombassa	... ...	Sept. 11, 1908
Dakar-Conakry	... ...	July 11, 1908

Transvaal.—The telegraph system in 1906-7 increased by 282 m. of line and 49 km. of wire; 4,011 and 15,729 km. of line and wire were aerial, while 8 and 224 km. were subterranean. There were 254 offices open to the public—an increase of 12 over the previous year. Of the offices, 128 belonged to the railway service. The total number of telegrams dealt with was 3,441,864, against 3,594,835 in 1906. Of these, 1,187,070 were dispatched to, and 1,236,306 were received from, the interior, 51,048 were sent by cable, and there were 967,440 telegrams in transit. Receipts amounted to £80.234, as against £93,239 in 1906—a decrease of £13,005. The Postmaster-General ascribes this decrease to the state of the Colony's commerce, and the greater use of telephones. The value of free official telegrams was £16,469. On the messages sent by cable, the Transvaal Government received by way of tolls £2,749—a decrease of about £443 as compared with 1906.

The telephone service increased by 270 km. of line on poles and by 47 km. underground to 1,100 and 107 km. respectively, while the length of wire increased by 15,056 km. to 42,600 km.

At Johannesburg there were 2,373 ordinary and 212 Government stations; at Pretoria the figures were 336 and 231. The number of offices increased by 490, as compared with 1906. Besides these offices, there were 66 public call offices, of which 41 were in the Witwatersrand district and four at Pretoria. The number of conversations numbered about 9,000,000 and 1,100,000 with Johannesburg and Pretoria alone. Receipts on account of the telephone service were £59,186, as against £54,682 in 1906.

Under the heading of expenses appeared sums of £4,639, subsidy to the Eastern Telegraph Co., and for maintenance, &c., of the telegraphs, £8,126, and of telephones, £5,925.—*Journal Télégraphique.*

United States.—The *Telegraph Age* states that the Atlantic Telegraph Co., of the United States, has been acquired by the Telepost Co., of New York, of which Mr. H. Lee Sellers is the president. The Atlantic Co. was leased in 1887 to the Baltimore and Ohio Telegraph Co. for a term of 20 years, which, in turn, was absorbed by the Western Union Telegraph Co. The lease expired in 1907, and as conditions of re-lease could not be agreed upon between the Western Union and the Atlantic Co., the latter again took over its own property.

Wireless Telegraphy.—The managing engineer of the Marconi Wireless Telegraph Co., who has just returned from Canada, stated to an interviewer that his company expected shortly to be able to deal with 30,000 to 40,000 words a day across the Atlantic; at present it deals with about 5,000.

A new wireless telegraph installation has been erected at Kahuku, Hawaii Islands.

The German fishing industry is adopting wireless telegraphy. The flagship of the fleet is equipped, and can send messages to the mainland.

CONTRACTS OPEN and CLOSED.

OPEN.

Aberdeen.—November 23rd. Stores, including electric lighting material, for the Great North of Scotland Railway Co. Forms of Tender from the Stores Superintendent, 80, Guild Street, Aberdeen.

Algeria. — Bone. — January 15th. The municipal authorities of Bone—a town of 43,000 inhabitants—are inviting offers for the establishment and working of a central station for public and private electric lighting and power purposes, and for the construction and operation of a system of electric tramways. The Municipal Council will give a guarantee in respect of the tramways, and give the land on which to build the generating station.

Argentina.—The *Boletin Oficial* of September 24th contains a decree authorising the Government to arrange for the construction of the following telegraph lines:—(*a*) From Rio de las Piedras to Anta and Rivadavia; (*b*) from Ledesma to Oran; (*c*) from Salta to Cachi, Molinos and Poma. A sum of 150,000 pesos has been set aside for this work.—*Board of Trade Journal.*

Australia.—Tasmania.—March 15th, 1909. Postmaster-General. Telephone switchboard, common-battery system and apparatus for use at subscribers' premises, Launceston. Specifications and particulars of general conditions can be inspected at the offices of the Electrical Review.

Victoria.—Three sets of testing instruments, for the P.M.G. See "Official Notices" October 16th.

Victoria.—Submarine cable-repairing plant for the P.M.G. See "Official Notices" November 6th.

Colchester.—November 30th. Electric lighting plant, motors, wiring, telephones, &c., for the Essex County Lunatic Asylum. See "Official Notices" October 30th.

Dublin.—November 30th. Stores for the Dublin United Tramways Co. (1896), Ltd. See "Official Notices" October 30th.

Eccles.—November 14th. Electric light wiring and fitting of the Cleansing and Scavenging Committee's buildings at the Town's Yard. Specification from the Town Clerk, Town Hall.

Germany.—Tenders will shortly be invited by the town authorities of Stendal for the establishment of an electric lighting service, at a cost of 3,000,000 marks.

Aachen.—An extension of the existing electric establishment, involving an outlay of 106,000 marks, has been decided upon by the Town Council.

Gottrazhofer (Wurtemberg).—Tenders are invited for an electric service, to cost 250,000 marks.

The municipal authorities of Gottrazhofer (Wurtemberg) are about to invite tenders for the establishment of a central electric lighting station in the town.

Hackney.—December 17th. D.C. electricity meters, of the ampere-hour motor type, for the electricity department. See "Official Notices" to-day.

Hungary.—The municipal authorities of Obecse are at present inviting tenders for the establishment of a central electricity station for the electric lighting, not only of Obecse, but also of two small towns in the neighbourhood.

Manchester.—November 17th. Steel tie-bars, bolts and nuts for the T.C. Two steel boilers for heating purposes and hard-drawn copper trolley wire for the T.C. Tramways Committee. J. M. McElroy, General Manager, Tramways Department, 56, Piccadilly, Manchester.

Oldham.—November 20th. Mechanical stokers for the Greenhill generating station for the Electricity Committee. Specifications (one guinea) from Mr. S. W. Newington, Borough Electrical Engineer.

Spain.—November 21st. The municipal authorities of Salt (province of Gerona) are inviting tenders for the concession for the electric lighting of the town during a period of 10 years. Particulars may be obtained from, and tenders are to be sent to, El Secretario del Ayuntamiento de Salt (Gerona).

November 20th.—Tenders are being invited by the municipal authorities of Almoral (province of Alicante) for the concession for the electric lighting of the town for a period of 15 years. Tenders are to be sent to, and particulars may be obtained from, El Secretario del Ayuntamiento de Almoral (Alicante).

The *Gaceta de Madrid* of October 27th contains a copy of a Bill to be laid before the Parliament authorising the Deputacion Provincial of Guipuzcoa to establish and exploit during 35 years an interurban telephone system, to render communication possible between the various towns of the province.—*Board of Trade Journal.*

Wakefield.—November 19th. Stores for the Wakefield and District Light Railway Co. See "Official Notices" November 6th.

Warrington.—November 20th. Telegraph materials for one year for the Cheshire Lines Committee. S. S. Barton, Stores Superintendent, Cheshire Lines, Warrington.

CLOSED.

Dudley.—The Sanitary Committee of the T.C. has accepted the tender of the Horsfall Destructor Co., Ltd., for a 2-cell destructor, at £2,113.

London. — Holborn. — The B.C. has received the following tenders (the disparity between the prices is as remarkable as ever!) for the electric light installation at the High Holborn Library:—

John Holding & Sons, Ltd.	(accepted)	£78
Barlow Bros. & Co.		196
Comyn Ching & Co., Ltd.		175
D. Hulett & Co., Ltd.		119
Marryat & Place		171
Foote & Milne, Ltd.		101

L.C.C.—The L.C.C. on Tuesday decided to accept the offer of the Frodingham Iron and Steel Co., amounting to £13,017, for the supply of slot rails and conductor tee rails, and that of Bolckow, Vaughan & Co., at £8,150, for track rails and fastenings. The Highways Committee have received eight tenders for the reconstruction of the bridge carrying Mare Street, Hackney, over the Regent's Canal. The lowest, which was submitted by Messrs. Dick, Kerr & Co., at £4,217, is recommended for acceptance.

Milan.—The city of Milan is having a large hydro-electric station erected near Grossotto, in the Veltin, and a Milan correspondent of a German newspaper states that the committee entrusted with the examination of the tenders has arrived at the decision to place with the local Tecnomasio Italiano Brown-Boveri, which is a subsidiary of the Swiss firm of Brown, Boveri & Co., of Baden, the order for the delivery of three alternators of 10,000 H.P. each, whilst the Italian firm of Riva Monneret is to supply the hydraulic turbines.

Perth.—Messrs. A. Westwood & Son have secured the contract for electric lighting work at the Central District School (£76).

Pontypridd.—The U.D.C. has accepted the tender of Messrs. Heenan & Froude for a refuse destructor, at £11,225.

Portsmouth.—The T.C. has accepted the tender of the British Insulated and Helsby Cables, Ltd., at £554, for low-tension paper-insulated cable. The next lowest tender was that of W. T. Glover & Co., Ltd., at £563.

Walsall.—The T.C. has accepted the following tenders in connection with the electricity undertaking:—

Templer & Rance, Ltd.—16-in. atmospheric exhaust valve for condensing plant, £27.
Worthington Pump Co., Ltd.—Two 24-in. sluice valves, £42.
John Spencer, Ltd.—24-in. exhaust steam pipes, £133.
Lacy-Hulbert & Co., Ltd.—Portable air-compressor, £49.

West Bromwich.—The T.C. has accepted the tender of Messrs. Heenan & Froude for the supply of a 2-unit destructor. The cost will be £11,000.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERDEEN.—Houses and shops in Holburn Street, for J. Mearns, warehouseman; Cameron & Watt, architects, 381, Union Street, Aberdeen. Addition to fish-curing premises, for J. Brodie, fish-curer; James Park, builder. Masonic Temple in Crown Street; H. M'Lennan, architect, care of Jenkins & Marr, 16, Bridge Street, Aberdeen.

ABOYNE (Aberdeenshire).—House at Aboyne. G. B. Mitchell, architect, 148, Union Street, Aberdeen.

ACCRINGTON.—New church. Vicar, St. Andrew's, Accrington.

ALVASTON (Derbyshire).—Suggested new Public Offices. Surveyor, Council Offices, Alvaston.

ARBROATH.—Buildings in High Street and Church Street, for the High Street Co-operative Society.

ASTLEY (Lancs.).—Blocks of houses, for the Pilkington Colliery Co. Mr. Cross, Astley Peel Hall.

BANBURY.—Additions to North Newington Schools. Architect to Education Committee, Oxford.

BARNARD CASTLE.—House, Vane Road, for Mr. Hughes; house, Raby Avenue, for W. Heslop.

BARNSLEY.—Grammar School for Boys in Shaw Lane (300 scholars). G. A. Bond, clerk to the Governors, Barnsley and District Holgate Grammar School, 8, Regent Street, Barnsley.

BELFAST.—New schools in Seaforde Street; J. J. M'Donnell, architect, 27, Chichester Street, Belfast. Three blocks of warehouses at Murray's Terrace, for Belfast Linen Handkerchief Co. (£25,000); J. A. Hanna, Belfast.

BIRMINGHAM (Handsworth).—Proposed secondary school for girls. Chairman, Education Committee, Education Offices, Soho Hill, Handsworth.

(Acock's Green).—Petty Sessions Court, cells and police station buildings, for Worcestershire C.C. Standing Joint Committee. A. B. Rowe, county architect, 30, Foregate Street, Worcester.

BISHOP'S CASTLE (Salop).—New Congregational Church.

BLAIRGOWRIE (Perthshire).—Proposed new church for U.F. congregation, Rattray. Mr. Owen, secretary of Committee.

BOLTON.—Important colliery developments; Messrs. S. Scowcroft & Sons, Rosehill Collieries, Bolton. Eleven houses, Ashworth Lane; Messrs. Scholes & Howard. Twenty houses off Chorley Old Road; Mr. Boyle. Additions to buildings; Bolton Model Poultry Farm Co.

BOURNEMOUTH.—Proposed new church at Canford Cliffs (£12,000); Canon Dugmore, vicar of Canford Cliffs. Enlargement of the National Schools, Moordown.

BRAMPTON (Cumberland).—New secondary schools for the Cumberland C.C. (£5,400).

BRECHIN.—New hall in Montrose Street for City Mission.

BRIDLINGTON.—Proposed schools for 700 children, for the T.C. (£9,000); new high school for girls (£6,650); J. Earnshaw, architect, Carlton House, Willington Road, Bridlington.

BURNLEY.—New Nurses' Home at the Workhouse. G. and S. Keighley, architects, Burnley.

BURSLEM.—Alterations to premises, 6, Rushton Road. S. Swetnam.

BURY.—New cotton store room at Foundry Street Mills; Roger Peel.

BUSHBURY (Staffs.).—New Council school in Bushbury Lane. G. Balfour. Director of Education, County Education Offices, Stafford.

CALSTOCK (Cornwall).—New United Methodist Chapel and school. J. H. Reed, Tamar View, Calstock.

CAMBRIDGE.—Proposed new Council offices. County Architect.

CANNOCK.—Sixteen houses, Green Heath Road, Hednesford, for W. H. Moore; house, Hill Top, Hednesford, for A. Downes.

CARDIFF.—Installation of electric light at Museum. Town Clerk, Cardiff.

CARSHALTON.—Four houses, Wales Avenue, for E. J. Tinniswood.

CHATHAM.—Six bungalows, Walderslade, for H. W. Brake.

CHATTERIS.—Rebuilding of the Parish Church. J. Thompson & Co., builders, Peterborough.

CHELMSFORD.—Cattle market shed, Chelmsford. Chelmsford borough surveyor, 16, London Road, Chelmsford.

CHESTER.—Public elementary school in Egerton Street, Boughton (200 children); W. T. Lockwood, architect, 88, Foregate Street, Chester. Public elementary school in Cherry Street (660 children); Douglas & Minshull, architects, 6, Abbey Square, Chester.

CHESTERTON (Cambs.).—Houses, Richmond Road, for W. H. Bullman; De Freville Avenue, for A. W. Bedding; High Street, for J. C. Newman. Store, incubator room and office, Arbury Road, for W. P. Hollis; photographic studio, 19, Humberstone Road, for W. Tams.

CLACTON-ON-SEA.—Conveniences, East and West Cliffs, for the U.D.C. Surveyor, to the U.D.C., Town Hall, Clacton.

COVENTRY.—Four houses, Broad Street Jetty, for A. Cooper; six houses, Broomfield Road, for E. Twigg; extensions to premises, Foleshill Road, for Courtauld & Co., Ltd.; new street between Earlsdon Lane and Spencer Avenue, for G. F. Woodall; six new streets, Spencer Park Estate, for Band, Hatton & Co.

CREGGAN (Londonderry).—New schools in connection with Christ Church.

CRUMLIN (Mon.).—Important new colliery undertakings. Partridge, Jones and Co.

DARLINGTON.—Locomotive works, at Stooperdale, for the North-Eastern Railway; Wm. Bell, architect to the N.E.R. Co., York. Houses, Brighton Road, for Harker & Co.; Beechwood Avenue, for H. Mangham; Kitchener Street, for Clark & Moscrop. Printing works, Parkgate; Kitching & Lee, architects.

DARWEN.—Elementary school, for 510 children, for the T.C. R. W. Smith-Saville, borough engineer and surveyor, Municipal Offices, Darwen.

DERBY.—New United Methodist mission premises, corner of Pear Tree Road and Carden Street (seat 700); also proposed room for working men (£1,000).

DOVER.—Two houses at Kingsdown; A. W. Thompson, builder, Cambridge Place, Lower Walmer, Deal. House, Ewell Minnis; F. A. Tunbridge, builder, Aikham, Dover.

DUDLEY.—New bakery for the Co-operative Society (£2,480); Wm. F. Edwards, architect, Station Road, Blackheath, near Dudley. Proposed new Primitive Methodist Church in Vicar Street.

DUNDEE.—Workshops, &c., in Irvine Square, for Gas Commissioners. J. Thompson, burgh engineer.

DURHAM.—Business premises, Framwellgate, Waterside, for J. Gradon, builder, North Road; alterations at Half Moon Hotel, for G. Bell.

EASTLEIGH (HANTS.).—New schools (£4,868). M. E. Fitt, builder, Reading.

EDINBURGH.—Probable re-building, after fire, of the Uphall Oil Works, for Young's Paraffin Light and Mineral Oil Co.

ELLESMERE PORT (near BIRKENHEAD).—Proposed erection of mills for F. and A. Frost & Sons, millers, Chester.

ENFIELD.—Infants' department at the Southbury Road School, Ponder's End. G. E. T. Laurence, architect, 22, Buckingham Street, Adelphi, W.C.

EPSOM.—New church of St. Barnabas (£3,340). A. C. Williams and W. G. Horseman, architects; G. E. Wallis & Sons, builders, Maidstone.

FENCE HOUSES (Co. DURHAM).—Church Hall, at Shiney Row, for Rev. G. F. Holmes; parochial hall at East Rainton, for Rev. J. Croisdale.

FOLESHILL.—New vicarage at Exhall, for Rev. C. Simmonds, vicar.

FOLKESTONE.—Extensions to Victoria Hospital (£2,000). Adams Mewburn, architect, London.

FROME.—Extensive additions to Milk Street Schools, for Somerset C.C. E. G. Ames & Son, architects, Cork Street, Frome.

GILLINGHAM (KENT).—Proposed permanent church in connection with the Primitive Methodist Church. Rev. W. Wardle, pastor.

GLASGOW.—Two blocks of houses in Calder Road, Bishopbriggs, for Capt. A. Stirling, Keir; two tenements, New Street, for J. S. Campbell, Bishopbriggs; ten tenements in Holmlee Road and Garry Street, Cathcart, for S. Stevenson & Co., Logan Street, Polmadie; tenement houses, Arthur Street and Busby Road, Clarkston, for Wm. Hawthorne, Main Street, Busby; double villa, Brackenbrae Road, Bishopbriggs, for Wm. Stevenson, Crosshill, Glasgow.

GOLBORNE (SOUTH LANCS.).—Important sewage works developments. Surveyor, Golborne District Council.

GOSPORT.—New Baptist Church and schools in connection with Avenue Road Church. Rev. W. H. Berry, pastor.

GOUROCK (RENFREWSHIRE).—New church at Ashton (£4,000).

GUILDFORD.—Alterations to the Royal Grammar School, for the governors (£1,000).

HASTINGS.—Pair of semi-detached villas, St. Helen's Park Road, for F. Gildersleave, Birds Place, Hastings; F. S. Gildersleave, architect. Pair of semi-detached villas in Eversley Road, St. Leonards, for W. Field; Coussins & Rothwell, architects, Havelock Road, Hastings. Alterations to Roselands, Battle Road, for R. Hole; Jeffery & Son, architects, Havelock Road, Hastings.

HEADINGTON (OXON.).—Proposed church. G. Mallam, "Trelawney," Highfield, Oxon, treasurer.

HEATLEY (CHESHIRE).—Improved sewerage scheme. Surveyor, Council's Offices, Lymm, Cheshire.

HECKMONDWIKE.—Warehouse, Artillery Street, for W. Walker.

HELSTON.—Bungalow, for W. Thomas; farm dwelling house at Mawgan, for Sir Vyell Vyvyan; bungalow at St. Keverne, for W. Roskruge; house, at Wendron, for Jas. Richards.

HEMSWORTH.—Houses, Grove Cottage Lane, for G. Hillier; Low Ackworth, for Joseph Brown; Carr Lane, South Kirkby, for E. Deaville.

HEREFORD.—Mortuary chapel at the Cemetery, for the T.C. John Parker, city surveyor.

HERNE BAY.—House, Fleetwood Avenue, for R. N. Cattle. H. Pettman, architect, 15, High Street, Herne Bay.

HIGHER BROUGHTON (LANCS.).—Lecture Hall and Institute. F. W. Dixon and Son, architects, Manchester.

HODDESDON.—Probable re-erection (after fire) of premises for the Revolution Split Pulley Works Co.

HORNSEA (near HULL).—Two houses, Cliff Road, for Hobson & Beal; five houses, six villas and shop, for Mr. Pearcey.

HOUGHTON-LE-SPRING (Co. DURHAM).—Four houses, Bernard Street, for Ramsay & Fraser; houses and shops, Newcastle Street, for Geo. Bruce.

HUNGERFORD.—Enlargement of School. Architect to Berks Education Committee, Reading.

HOVE.—Proposed extensions and improvements and installation of passenger lift at Sackville Road Hospital (£3,000).

HOYLAKE (CHESHIRE).—Higher Elementary School. E. Ware, architect, 20, Exchange Street East, Liverpool.

HULL.—Houses, Ryde Street, for A. Williamson; Southcoates Lane, for J. Duffield; The Park, for H. Bignold; Anlaby Road, for T. J. Watts, builder, 234, St. George's Road; Marlborough Avenue, for J. E. Wray; Derwent Street, for E. Russell; Garden Village, for the Garden Village, Ltd.; Holderness Road, for G. J. Kennington; four shops and three houses, Holderness Road, for W. Jackson & Sons, Ltd.; dairy, &c., 99, New Bridge Road, for J. Cutting. Alterations and additions to Craven Street School; J. H. Hirst, city architect, Town Hall, Hull. Premises in Holderness Road; A. Easton, architect, 7, Land-of-Green-Ginger, Hull.

ILKLEY.—Proposed electric lighting at Council's gas works, also public baths contemplated. Surveyor, Council Offices, Ilkley.

KEARSLEY.—Two houses, for J. W. Hilldrup & Co., Moss Rose Mills, Kearsley.

KIRBY-IN-CLEVELAND.—House, stables, &c., for S. Dunning, Oxford Street, West Hartlepool.

KIRKHAM.—New buildings in Freckleton Street. Utton Brothers.

LEICESTER.—Primitive Methodist Church and school in Marlborough Road.

LERWICK.—Works in connection with the Harbour extension. Jas. Barron, 216, Union Street, Aberdeen.

LIMPSFIELD.—House, Tenchley's Lane, for E. Bryant Johnson.

LINCOLN.—Houses, Cecil Street, for C. Sands; workshop, St. Benedict's Square, for Binks & Co., cycle manufacturers; rebuilding and additions to turnery at wood works, and smiths' shop, for Ruston, Proctor & Co., Ltd., engineers; club room at Shakespeare Hotel, for A. and B. Hall; probable re-erection (after fire) of works for Cannon & Co., glue and size manufacturers, Boultham.

LIVERSEDGE.—Additions to the works of the Stanley Coal Co.; working men's club, Hightown, for T. Horsfall.

LONDON (HOXTON).—Adaptation of part of Hoxton House for temporary school (electric lighting to be installed by direct labour); T. J. Bailey, architect to L.C.C. Education Committee.

(WOOLWICH, S.E.).—Shop at 27, Herbert Road, for W. Sutch.

(WOOD GREEN, N.).—Secondary school (£127,000). Middlesex Education Committee, Guildhall, Westminster, S.W.

(E.C.).—Contemplated enlargement of the Cripplegate Institute. B. T. Swinstead, Chairman of the Institute.

(HOLBORN, W.C.).—Additions to Homœopathic Hospital, Queen's Square and Great Ormond Street. E. T. Hall, architect, 54, Bedford Square, W.C.

LONDON (HACKNEY, N.E.).—Building at 10, Tower Street; T. Gates & Sons, builders, 187, Queen's Road, Dalston, N.E. Two two-storey factories; Hodson & Whitehead, architects, 7, Finsbury Square, E.C. Addition to warehouse; N. Fortescue, contractor, 215, Mare Street, Hackney. Additions to 40, Chatham Place; Hodson & Whitehead, architects, 7, Finsbury Square, E.C. Formation of two streets 40 ft. wide, between Spring Hill and Craven Walk; British Land Co., Ltd., 28, Moorgate Street, E.C. Higher school, Lauriston Road, South Hackney (320 places) (£11,773); T. J. Bailey, architect to L.C.C. Education Committee.

(HYDE PARK CORNER, W.).—Additions at Tube Station. D. Joseph, architect, 73, Basinghall Street, E.C.

(S.W.).—Shop at 105, Lupus Street, Pimlico. Brient & Son, surveyors, 200, Kennington Park Road, S.E.

(CHELSEA, S.W.).—683 tenements, and 53 lock-up shops (£150,000), near Marlborough Square, for Trustees of Sutton Estate. E. C. P. Monson, architect, 182, High Street, Acton.

(E.).—School, Marner Street. T. J. Bailey, architect to L.C.C. Education Committee.

(W.).—Adaptation of Empress Hall, Earl's Court, as a roller-skating rink. A. O. Collard, architect, 8, Buckingham Street, Strand, W.C.

(UPPER TOOTING, S.W.).—Additional workshop at St. James Road branch workhouse; F. W. Piper, Clerk to Wandsworth Guardians, St. John's Hill, S.W.

(WILLESDEN, N.W.).—Sixty-five houses, Ellesmere and Aberdeen Roads; J. C. Hill, builder, 55, Glenmore Road, Hampstead. St. Gabriel's Parish Hall, Chichele Road. Proposed additions to hospital; W. J. J. Stewart, medical superintendent.

(LEWISHAM, S.E.).—Five houses in Chalcroft Road; W. J. Scudamore and Sons, builders, 13, Manor Lane, Lee, S.E. Nineteen houses in Muirkirk Road; Norfolk & Prior, architects, 4, Station Buildings, Catford Hill, S.E.

(BERMONDSEY, S.E.).—Additions to Guy's Hospital; Woodd and Ainslie, architects, 20, Tothill Street, S.W. Erection of vestry and porch at St. Paul's Church, Kipling Street; J. M. Kennard, architect, 13, Railway Approach, London Bridge, S.E.

(LEYTON, N.E.).—New Council school in Sybourn Street. W. Jacques, architect, 2, Fen Court, Fenchurch Street, E.C.

LONGHOR (GLAM.).—Extensive additions to St. David's Tinplate Works.

LOWESTOFT.—New secondary school. R. B. Nicholson, town clerk, Town Hall, Lowestoft.

LUTON.—Houses, Talbot Road, for A. Butt; Dunstable Road, for S. W. Johnson; Selbourne Road, for C. H. White, builder, 72, Dunstable Road; Reginald Street, for W. Baxter; Ridgway Road, for A. Cole, builder, 183, High Town Road; Hitchin Road, for W. Frost; Reginald Street, for F. Chandler, builder, 78, Cromwell Road; Havelock Rise, for F. Summerfield; Albert Road, for W. Smith; Shirley Road, for J. Saunders & Son, Duke Street; off Ramridge End Road, for A. Mardle, builder, 18, Cowper Street; premises in Chase Street, for Geo. Linger; public house, Park Street, for Pryor, Reid & Co.; additions to premises in Park Street, for T. Day; alterations to premises, George Street and King Street, for the London, City and Midland Bank Co., Ltd.; extensions to premises, Nelson Street, and factory, Wellington Street, for A. R. Bird; public house, Round Green, for J. W. Green, Ltd., brewers, Park Street, West.

LYTHAM (LANCS.).—Detached house, St. Paul's Avenue, for the St. Paul's Avenue Estate Co.; detached house, Park Avenue, for P. Roberts.

MALVERN.—Residence, Barnard's Green, for H. Williams; detached house, Wilmot Road, Upper Howsell, for E. Lockyer; additions to Shenstone, Church Street, for Mr. Trapnell. New schools in Somer's Park; County Architect, Worcester.

MANCHESTER.—Women's lodging house in Corporation Street. City architect, Town Hall, Manchester.

MARSDEN (near HUDDERSFIELD).—New school for the West Riding of Yorks C.C. J. Vickers-Edwards, County Architect, Wakefield.

MERTHYR TYDFIL.—Proposed new building for the Y.M.C.A.; A. Young, secretary to the Y.M.C.A., Church Street, Merthyr Tydfil. Additional pavilion to Mardy Hospital; T. Aneuryn Rees, Town Clerk, Merthyr. Proposed conversion of Cyfarthfa Castle Secondary School, &c.; T. Aneuryn Rees, Town Clerk.

MINEHEAD (SOMERSET).—House on the North Hill, for R. H. Holman. Andrew and Hosegood, architects, Williton, Somerset.

MONK BRETTON (YORKS.).—Three houses near Rock Terrace; A. L. Goddard, architect, Barnsley Road, Cudworth. Three houses, Cliffe Lane, for Geo. Harrison.

MOSTON (near MANCHESTER).—New St. Luke's Church. Rev. J. Appleyard, Rector, Moston.

NEWCASTLE (Co. DOWN).—New baths contemplated.

NEWCASTLE-ON-TYNE.—Public hall and reading room at Shiremoor. Enlargement of the head post office, for H.M. Office of Works; Postmaster, Newcastle-on-Tyne.

NEWTON ABBOT.—Water works, pumps and engines for the R.D.C. S. Dobell, engineer, Queen Street Chambers, Exeter.

NORTHAMPTON.—House, Park Avenue; A. E. Anderson, surveyor, 64, Abington Street, Northampton. Additions to Admiral Nelson public house, The Green, for W. B. Troup.

NORTHFLEET.—Houses, Downs Road, for Mr. Rix. C. W. Perrott, architect.

OLDBURY.—Proposed new schools at Abbey Road, Warley. S. Vernon, secretary to the U.D.C. Education Committee, Public Buildings, Oldbury.

OTLEY (near IPSWICH).—Additions to Silverdene (residence). B. Winship, architect, 9, Denning Road, Hampstead, N.W.

PENISTONE.—New secondary school for the Governors of the Grammar School (£7,000). W. S. Braithwaite, architect, 6, South Parade, Leeds.

PENNINGTON (near LEIGH, LANCS.).—Renovation of parish church. Rev. L. S. Murdoch, vicar.

POOLE.—House, water tower and pump house, Stanley Green, for Lady Wimborne; motor house, Dursley, Longfleet Road, for Dr. Small; Liberal Club premises, Salisbury Road, Smart & Wyeth; houses, Bournemouth Road, for W. Comyns; Hamworthy, for Carter & Co., Ltd.; Penn Hill Avenue, for J. Wright; Eaton Road, for W. P. Hayter & Son; Sandbanks Road, for J. H. Wilson. Proposed new school in Richmond Road (600 places); Borough surveyor.

PONTEFRACT.—Proposed secondary school for girls in the Park (£5,250). C. Lowden, secretary to the Governors of the Grammar School, Ropergate, Pontefract.

PRESTOLEE (LANCS.).—Large sewage works contemplated. Surveyor, Rural Council, Bury, Lancs.

PRESTON.—School buildings in Deepdale and St. Stephen's Roads, for the Preston Education Committee. Borough surveyor, Town Hall, Preston.

QUORN.—Villas, Chavepey Road, for J. C. Cradock and H. H. Speight; houses, Barrow Lane, for Thompson & Gamble.

READING.—Elementary school at Childrey (140 scholars); Berkshire Education authority. New Hall for St. Luke's Church (£1,400); S. Stallwood, architect, 27 and 28, Market Place, Reading. Enlargement of the Hospital (£20,000); Chas. Smith & Co., 164, Friar Street, Reading.

ROCHESTER.—Two houses, Cliffe Road, Strood, for W. Carter.

ROTHERHAM.—Houses, Selborne Street and Lindley Street, for Charles Green; Bramwell Street, for Herbert James; Clement Street, for Miss E. Johnson; business premises, Badsley Moor Lane and Boswell Street, for the Masbro' Equitable Pioneers' Society, Ltd.

ST. ANNE'S.—Technical Institute extensions, £1,200; public mortuary; three pairs semi-detached houses in St. David's Road, J. Hall; alterations and extensions to property for the Roman Catholic School Trustees, J. R. Bannister and J. Steele & Co.

SALFORD.—Proposed new infants' school in Robert Hall Street; Direction of Education, Salford. New place of entertainment in Garden Lane, Blackfriars, Salford, for T. Whiteley, Blackfriars Road, Salford.

SALISBURY.—New Wesleyan Methodist Sunday School at Winterslow.

SEDGELEY (near DUDLEY).—New special subjects school. Staffs. Education Committee.

SHAW (LANCS.).—Twenty-five houses in Bertha Street, and 43 houses in Grace Street and New Street. J. Whyte.

SHEFFIELD.—New Church of St. Oswald's, Mill-houses. J. D. Webster, architect, Cairns Chambers, Sheffield.

SILKSWORTH.—Houses, Somerset Street, for J. and W. Hodgson; Somerset Street, for W. Watson & Co.

SOUTHAMPTON.—Four houses, Vincent Avenue; Jukes & Son, builders, Richmond Road, Southampton. Two houses, Charlton Road; Jurd & Sanders, architects, 23, Portland Street, Southampton. Twenty-eight houses in Hanley, Milton, and St. James' Roads; J. V. Blake. Two houses, Winchester Street; Weston and Burnett, architects, 24, Portland Street, Southampton. Extensions to Western District and Ascupart Schools, for the Education Committee (£20,000).

STANDISH.—Alterations and extensions to Dog and Partridge Inn. Oldfield Brewery Co.

STRATHAVEN (LANARKSHIRE).—New hall at Ward Street, Drumclog, for Lodge 211, I.O.G.T.

STROUD (GLOS.).—Proposed new Craft School, for C.C. (£4,000).

SWANSEA.—Alterations to Westfa, Eaton Crescent; Wm. Davies, builder, Weig Gendros. Conversion of disused church, Castle Street, into café, for the Kardomah Café Co., High Street; 12 houses on the Garden City site, for the T.C. (£3,400).

SWINTON (MANCHESTER).—New Council school in Cromwell Road. Secretary, Swinton and Pendlebury Educational Committee.

TAUNTON.—New residence at Staplegrove, for C. Riddle; additions to residence at Haines Hill, for G. H. Kite.

TONBRIDGE.—New building for the Y.M.C.A.; J. F. W. Deacon, president of the Association. Two shops, Douglas Road, for Mr. Sears; villas, Goldsmid Road, for E. Gillet; villas, The Drive, for J. Carley.

WALKDEN.—Colony of houses at Tynesbank, and new engine houses and other developments at Mosley Common Collieries. Captain H. V. Hart-Davis, Bridgewater Offices, Walkden.

WALTON-ON-THE-NAZE.—New Council school for the Essex Education Committee.

WARE.—House and shop, Wadesmill, for E. S. Hanbury.

WARLINGHAM.—House, West Hall Road, for O. Quittenden.

WARRINGTON.—Important alterations at Church Street Boys' School. Director of Education.

WESTON-SUPER-MARE.—New church (£8,000). Rev. Mr. Polehampton.

WEYMOUTH.—Completion of the Church of St. Paul, Westham (£3,000); also new St. Martin's Church.

WINDSOR.—New barracks for the War Office. J. & M. Patrick, builders, Wandsworth, London, S.W.

WOLVERHAMPTON.—Alterations to the School Board Offices. Stafford Street T. H. Fleeming, architect, Queen Square, Wolverhampton Nurses' home at the Workhouse, Heath Town; A. W. Worrall architect, North Street, Wolverhampton.

WORKSOP.—Showrooms, Bridge Place, for R. Shaw & Son; six houses, Stubbing Lane, for Foster & Mokes.

WREA GREEN (near BLACKPOOL).—New Workmen's Club premises. Secretary, Workmen's Club Building Fund Committee, Wrea Green.

WREXHAM.—Public Hall and shops; Davies & Son, architects, Chester; Palace Theatre, shops and club; T. Price, architect, Liverpool

YARMOUTH.—Twenty-two houses, Priory Plain; J. Easloe, builder, Dene Side, Yarmouth. House, Norfolk Square, for W. J. Johnson.

YEADON.—Cookery department at South View Schools, for the West Riding of Yorks C.C. J. Vickers-Edwards, county architect, Wakefield.

YORK.—New Wesleyan Sunday Schools at Stamford Bridge. E. Taylor, architect, York; Harrison & Co., builders, Aldwark, York.

YSTRADGYNLAIS (BRECONSHIRE).—Intermediate School for 120 children. J. C. Rees, architect, Parade Chambers, Neath.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

The following orders are issued:—

Monday, Nov. 16th.—"A" Company. Infantry drill (Recruits) 6 to 7 p.m.
Tuesday, Nov. 17th.—"B" Company. Infantry drill (Recruits) 6 to 7 p.m.
Thursday, Nov. 19th.—"C" Company. Technical drill, 7 to 10 p.m.
Friday, Nov. 20th.—"D" Company. Technical drill, 7 to 10 p.m.
Tuesday, Nov. 17th.—Medical inspection for recruits, 6.30 to 7.30 p.m.
Wednesday, November 18th.—Lecture by Capt. Phillips for Corporals. Any other N.C.O.'s may attend.

(Signed) J. H. S. PHILLIPS,
Capt. and Acting Adjutant.

Fire Tests.—The British Fire Prevention Committee conducted, last week, an important series of fire tests with roller shutter doors intended to protect large openings allowable under the Building Act Amendments of this year. These doors were subjected to high temperatures for 2½ hours and 4 hours respectively. The official report of the result of the tests will be published shortly.

FORTHCOMING EVENTS.

To-day's Events (Friday, November 13th).—At 8 p.m. Borough Polytechnic Institute, Borough Road, S.E. Opening of the "Edric" Hall and new workshops by Earl Carrington.

At 5 p.m. At the University College. Physical Society. Papers on "The Phono-Electric Properties of Potassium-Sodium Alloys," by Prof. J. A. Fleming; "Note on the Recombination of Ions in Air," by Mr. P. Phillips; "The Influence of Magnetic Field on the Photographic Patterns Produced by the Electric Spark," by Mr. A. W. Porter; for exhibition, "An Experiment Illustrating an Anomalous Effect of Lagging Thin Wires," by Mr. A. W. Porter; and other papers.

Saturday, November 14th.—At 8 p.m. At the White Bear Hotel, Dale Street, Liverpool. Liverpool and District Electrical Association; smoking concert, to which all electrical or mechanical engineers are cordially invited, free.

At 7 p.m. At the Colonnade Hotel, Birmingham. Birmingham and District Electric Club. Paper on "Electric Power for Small Consumers," by Mr. V. E. Walters.

Monday, November 16th.—At 8 p.m. Engineering Lecture Room, Armstrong College, Newcastle-on-Tyne. Institution of Electrical Engineers. Address by president of Section, Mr. A. L. E. Drummond.

Tuesday, November 17th.—At 7 p.m. Institution of Electrical Engineers (Glasgow Local Section). Annual dinner, at the Grosvenor.

At 7.45 p.m. The University, Physical Laboratory, Manchester. I.E.E. Local Section. Lecture by Prof. E. Rutherford, of the University. [This lecture takes the place of the paper announced on the Syllabus, by Messrs. R. G. and J. G. Cunliffe, on "Vagabond Currents," which has been postponed for the time being.]

At 8 p.m. At the Royal United Service Institution. Junior Institution of Engineers. Presidential address on "Available Energy," by Mr. J. Swinburne.

At 8 p.m. At the Argyle Hotel, Birmingham. Junior Institution of Engineers, Birmingham Local Section. Presidential address by Mr. J. Swinburne on "Available Energy," to be read.

Wednesday, November 18th.—At 8 p.m. Royal Society of Arts. Opening meeting, session 1908-9. Address by Sir William White, K.C.B.

Thursday, November 19th.—At 8 p.m. At the Institution of Civil Engineers. Institution of Electrical Engineers. Distribution of premiums by Col. R. E. Crompton. Inaugural address and reception by Mr. W. M. Mordey.

At 8 p.m. Rugby Engineering Society. Paper on "Incandescent Electric Lamps," by J. Findlay.

Friday, November 20th.—At 8 p.m. At the Institution House. Institution of Mechanical Engineers. Papers on "The Resistance of Metals to Impact," by Messrs. T. E. Stanton and L. Barstow, and "Different Methods of Impact Testing on Notched Bars," by Mr. F. W. Harbord.

At 8 p.m. At the Siemens Institute. Conversazione of the Siemens Engineering Society.

Saturday, November 21st.—Association of Engineers-in-Charge. Social. Dance.

NOTES.

Institution and Lecture Notes.—ROYAL SOCIETY OF ARTS.—The programme of lectures for the Session, which is to be opened on Wednesday next with an address by Sir W. H. White, includes the following:—

CANTOR LECTURES.—Monday evenings, at 8 o'clock.
Oscar Guttmann, M.Inst.C.E., F.I.C., F.C.S., "Twenty Years' Progress in Explosives." Four lectures. November 23rd, 30th, December 7th, 14th.
G. L. Addenbrooke, M.I.E.E., "Electric Power Supply." Three lectures. January 18th, 25th, February 1st.
Leon Gaster, A.M.I.E.E., "Methods of Artificial Illumination." Four lectures. February 15th, 22nd, March 1st, 8th.
George Gerald Stoney, M.Inst.C.E., "Steam Turbines." Three lectures. March 22nd, 29th, April 5th.
F. W. Lanchester, "Aerial Flight." Three lectures. April 26th, May 3rd, 10th.

Among the papers to be read after Christmas are the following:—
Mons. Yves Guyot, "The Commercial Relations of France and Great Britain."
A. J. Barry, "Railway Development in China."
W. Rosenhain, "The Application of the Microscope to the Study of Metals."
C. R. Enock, "The Resources of Peru."
Hon. J. Ferguson, C.M.G., "Ceylon, the leading Crown Colony, in 1909."

INSTITUTION OF ELECTRICAL ENGINEERS (STUDENTS' SECTION).—The following is a list of arrangements that are announced for this Section for the 1908-9 session. The meetings will be held in the Library of the Institution, 92, Victoria Street, Westminster, on alternate Wednesday evenings:—

November 18th.—Opening address by Mr. J. S. Highfield (Member) on "The Responsibility of the Engineer."
December 2nd.—"Electric Road Vehicles" (other than tramcars), by Stanley M. Hills.
December 16th.—"Auto-Transformers and Metallic-Filament Lamps," by George H. Stevens.
January 20th, 1909.—"Modern Mining Switchgear," by John F. Shipley.
February 3rd.—"The Direct-Current Variable-Speed Motor and its Application to Modern Machine Tools," by W. Stanley Lonsdale.
February 17th.—"Purification of Boiler Feed Water," by Thomas Walmsley.
March 3rd.—"Rheostats," by J. S. Messent.
March 17th.—"Central Station E.H.T. Switchgear and Control," by Edward F. Hetherington.
March 31st.—"Electricity Supply," by W. Bernard Thompson.
April 21st.—"Sewage Pumping Electrically of a Small Town," by Joseph S. Lazarus.
*May 5th.—"Some Notes on Relays," by Ernest W. Moss.

* Annual general meeting for the election of Committee.

The meetings will commence at 7.45 p.m. and terminate at 9.15 p.m.

The following premiums are offered by the Council for the best papers read by students during the session: One premium of £10, two premiums of £5 each. Chairman of the Students' Committee is Mr. C. B. Nadaud (Extra Collegiate), Mr. E. W. Moss (Extra Collegiate) being vice-chairman. Mr. George H. Stevens, 266, Barry Road, Dulwich Park, S.E., is the honorary secretary.

SIEMENS' STAFFORDSHIRE ENGINEERING SOCIETY.—This Society opened the session on October 28th, at the new "Siemens Institute," Stafford. The retiring president, Mr. Lee Murray, delivered a short valedictory address, touching upon the great success which had

attended the first year of the Society's existence. Mr. F. W Schiller, the president for the ensuing session, then delivered his inaugural address on "Combustion in Theory and Practice," which was much appreciated by all present. It was illustrated by a number of lantern slides, and also by experiments which demonstrated graphically the theory of combustion. After considering these laws and the various fuels in use, the lecturer dealt with some well-known types of boilers, furnaces, and recording apparatus, indicating the sphere of usefulness—and the demerits—of each: some valuab'e data concerning temperatures and draught were also included. Incidentally, the speaker made out a clear case for mechanical stoking, and emphasised the necessity of smoke prevention if only for reasons of fuel economy. We understand that some remarks *re* producer-gas drew forth rank heresy from a gas engineer who proposed the vote of thanks.

Association of Teachers in Technical Institutions.—The fourth annual general meeting of the Association was held on Saturday, November 7th; Mr. Hanap, president of the Association for 1907-8, occupied the chair. The annual report and financial statement were adopted. The newly elected president of the Association is Mr. J. Wilson, M.Sc., head of the Chemical Department, Battersea Polytechnic, S.W., who has acted as honorary secretary of the Association since its formation in 1904. His successor in that office is Mr. P. Abbott, B.A., head of the Mathematical Department, Regent Street Polytechnic, W. At a meeting of the London branch of the Association held in the evening, a paper was read by Mr. W. J. Lineham on "Technical Education at the Franco-British Exhibition." Special reference was made to the excellent exhibits of the work of Trade Schools, Schools of Arts and Crafts, and the Technical Institutions.

Institution of Electrical Engineers (Glasgow Local Section).—The 7th annual dinner of this Section will be held on Tuesday, 17th inst. The opening meeting of the session took place on Tuesday last, when the chairman, Mr. W. W. Lackie, delivered his inaugural address. The Students' Section began its meetings on October 16th.

Royal Society.—Lord Rayleigh having decided not to accept re-election as President (having occupied that office three years), the Council has nominated Sir Archibald Geikie, K.C.B., as President for 1908-9.

Metropolitan Association of Electric Tramway Managers.—A meeting of this Association was held at the Municipal and County Club, on Friday, 6th inst., when the following attended:—Mr. Blain, West Ham; Mr. Ullmann, East Ham; Mr. Coveney, Erith; Mr. Schofield, Leyton; Mr. Shaw, Ilford; Mr. Hammond, Metropolitan Electric; Mr. Howard, Barking; Mr. Mittelhausen, Bexley; Mr. Mason, South Metropolitan; Mr. Balfour, Dartford; Mr. Goodyer, Croydon. Mr. Blain was re-elected chairman, and Mr. Goodyer honorary secretary. A communication from Sir E. R. Henry, Commissioner of Police, was read with regard to various Metropolitan Public Carriage Licensing matters. The hon. secretary was directed to send a reply thereto. The chairman reported the result of an interview which the hon. secretary and himself recently had with several of the Metropolitan Members of Parliament at the House of Commons, regarding licensing matters. A discussion ensued, and it was ultimately agreed to furnish the various M.P.'s with the information they specially asked for.

Royal Colonial Institute.—On Tuesday last Mr. J. Henniker Heaton read a paper on "Penny-a-Word Telegrams throughout the Empire." Lord Jersey presided, and amongst those present were many representatives of Colonial Governments and others interested in Imperial communications. Mr. Heaton said that the public were paying 4 millions a year for what could be supplied for £130,000, and advocated the purchase of the submarine cables at market price, or the provision of new cables and overland lines, with the reduction of the charge for telegrams between all parts of the Empire to one penny a word.

The Hon. R. Lemieux, P.M.G. of Canada, expressed approval of the proposal. Mr. Marconi urged the claims of wireless telegraphy, which had transmitted 300,000 paid words across the Atlantic in one year, and, in reply to Mr. Heaton, said he would reduce the price at once to a penny a word if the Governments concerned would pay the working expenses of both stations and a "comparatively moderate" subsidy. Mr. G. R Neilson pointed out that the data given in the paper were inaccurate, and other speakers took part in the discussion.

Institution of Electrical Engineers.—Owing to the death of Prof. Ayrton, Past President, the General Meeting yesterday was to be adjourned after a reference by the President and Prof. J. Perry to the loss which the Institution had sustained. The President will deliver his inaugural address on Thursday next.

Copper.—Messrs. Merton's report for October 31st shows slightly decreased visible supply (51,532 tons, against 52,245 for October 15th). No remarkable divergence from the average is to be noticed in the derivation of the copper. The tendency of the whole market, at present, is for buyers to come in, tired of waiting for prices to drop in accordance with the high visible supplies. There is a probability of this movement being aided by speculators, and, in case the disturbed political outlook be unduly long in clearing, increased prices must result. The election in the United States has had a temporary influence on prices.

Fatality.—Last week the inquest was concluded on A. W. Gallard, 24, an employé of the G.P.O., who died through inhaling gas at the bottom of a deep telephone manhole in Bermondsey. He was rescued by his mate, A. T. Foster, in an unconscious condition, and was taken to Guy's Hospital, where he suffered from frequent convulsions. After a week he died. Much mystery surrounded the question as to the nature of the gas, but it was not solved, and the jury returned a verdict of death by misadventure.

State Water-Power Monopoly in Switzerland.—The new article of the Swiss Constitution recently approved by a national referendum provides that the utilisation of water-power shall be subject to the superintendence of the Confederation. The Legislature will prepare the general regulations requisite for the preservation of public interests and for securing the appropriate use of the water-powers, and inland navigation is to be considered in this connection as far as is practicable. With this reservation the regulation of the use of the water-powers devolves upon the Cantons. Nevertheless, if the water courses which are to be drawn upon are under the authority of several Cantons, and the latter are not able to come to an understanding in respect of a common concession, the granting of the concession will become the business of the Confederation. The Confederation will also settle this question with the aid of the interested Cantons when the water-courses touch the boundaries of Cantons. The dues and taxes paid for the utilisation of the water-powers will belong to the Cantons or to those justified by the Cantonal legislation. In the cases of concessions proceeding from the Confederation, the dues and taxes will be fixed by it after hearing the Cantons concerned and giving just consideration to their legislation, whilst the duty of settling them in regard to the remaining concessions will be performed by the Cantons within the limits to be determined by federal legislation. The sale abroad of electrical energy produced by water-power can only take place with the consent of the Confederation. All concessions granted after this article comes into force will be subject to the reservation of future federal legislation, and the Confederation is empowered to issue legal regulations regarding the transmission and sale of electrical energy.

Dolgarrog Aluminium Works.—Referring to the description of these works in our last issue, we understand that, as sub-contractors to Messrs. Bott & Stennett, Ltd., Messrs. J. B. Saunders & Co., of Westminster, erected the 20,000-volt transmission line between the generating station at Snowdon and the Aluminium Corporation's works at Dolgarrog, a distance of nearly 13 miles.

Manufacture of Telegraph and Telephone Plant.—In Monday's Parliamentary Papers, Mr. Joynson-Hicks asks the Postmaster-General whether the Post Office factories are intended or used primarily for manufacturing purposes, or are intended or used primarily for repairing purposes; whether the factory buildings are utilised to their full capacity; and whether it is proposed to extend the use of the factories, more especially in view of the fact that the Post Office will shortly become the sole consumer of telephone apparatus in this country.—Mr. Sydney Buxton, in reply, states that the Post Office factories are intended and used primarily for repairing purposes. He does not think it would be expedient largely to undertake in present circumstances at the factories the work of telegraph and telephone manufacture. Of recent years British manufacturers have, with Post Office encouragement, put down plant for telephone apparatus construction, and it is to them he looks for assistance in telephone development. His endeavour is to keep employment at the factories at a constant level, and for this purpose he entrusts certain items of construction work to them normally, and others from time to time.

Electrical Production of Steel.—A paper dealing with this subject was recently submitted to the Frankfort district branch of the Association of German Engineers by Dr. Kollmann, of Ems, who has taken particular interest in the question. He pointed out that by the utilisation of blast furnace and coke oven gases a large reduction had been effected in the cost of production of electrical energy, and this had rendered it possible to employ the electric current as the most favourable source of heat for furnace work. Although the existing blast-furnace system would continue for a long period, the author considered that the electric furnace working as an electrode furnace or induction furnace with single-phase or three-phase current would play an important part in introducing far-reaching improvements in the quality of the liquid metal drawn from the basic converter or the open-hearth furnace. The system is specially intended to render the German iron and steel industry completely independent of foreign raw material, and at the same time to furnish a high grade quality of steel to the small works. Dr. Kollmann added that electrical steel would be of particular value for bridge work and other constructional works, durable railway rails and machine building, and would lead to a better utilisation of the material.

Football.—On Thursday last week, at Peckham Rye, a match was played between the L.C.C. Tramways Sub-Station Football Club and Fairlawn (New Cross Depôt). Result, a draw, 1—1.

Franco-British Memento.—From Messrs. Le Carbone we have received a beautifully-executed memento of their exhibit at the Franco-British Exhibition. It takes the form of a medallion in carbon, partly polished, on each side of which appears an excellent design with appropriate wording.

Interment of Prof. Ayrton.—The funeral of the late Prof. Ayrton took place yesterday at Brompton Cemetery, and was attended by a large number of mourners, including representatives of the City and Guilds Institute, the Central Technical College, the Institution of Electrical Engineers, the Physical Society, the Royal Society and other bodies with which he had been connected.

(*Continued on page* 852.)

WILLIAM EDWARD AYRTON, F.R.S.

It is with deep regret that we record the death of Professor W. E. Ayrton, at the early age of 61. A pupil of Lord Kelvin, of whom he wrote an affectionate and reverent eulogy early in this year, Prof. Ayrton has not tarried long behind his old leader. He was a man of intense earnestness of character, of impetuous energy, and burning with zeal for the advance of science and the progress of civilisation; indeed, it may be truly said of him that his career was like that of a volcano—the consuming fires of his mental activity burnt too fiercely for their mortal frame, which was never robust, and his constitution failed under the excessive strain imposed upon it.

Prof. Ayrton's health, in fact, showed signs of breakdown some years ago, and he was compelled for a time entirely to abandon his labours at the Central Technical College in order to recuperate his physical strength — an ordeal which, to his restless temperament, must have proved unspeakably irksome. Although he recovered sufficiently to resume attendance at the College, his health had suffered irreparable injury, and he was obliged to narrow the scope of his occupations; of late years, indeed, he rarely took part in the discussions of the Institution of Electrical Engineers, in which he had formerly been one of the most prominent and popular speakers.

William Edward Ayrton, F.R.S.

From his youth Ayrton was marked for distinction, and before he attained his majority he secured an important post under the Indian Government, thus, like many of his fellow pioneers in electrical engineering, commencing his career by way of the Telegraph Service. In this department he rapidly rose to the highest position open to him. In 1873 he was appointed Professor of Natural Philosophy at the Imperial College of Engineering, Tokio, Japan. It was here, two years later, that his famous collaboration with Prof. Perry commenced: together they laid the foundation of technical education in Japan, and together their names became renowned throughout the world as leaders in the science of electrical engineering.

In 1879 Ayrton became Professor of Applied Physics at the Finsbury College of the City and Guilds of London Institute, where, a few years later, Perry joined him as Professor of Mechanical Engineering. Their combined genius gave rise to a series of electrical measuring instruments, besides other devices, which for a long time held the field by virtue of their excellence; they established principles which have stood to this day, and their inventions have become proverbial as anticipating, in principle if not always in design, innumerable later inventions and apparatus. The clock-meter with magnetic braking, for instance, was one of their joint products, while in other fields, the surface-contact system of electric traction, and (with Prof. Fleeming Jenkin) electric telpherage, were originated by "Ayrton and Perry." But we dare not embark upon an account of the pioneer work that they accomplished, as our space would prove insufficient for the purpose; suffice it to say that it was wonderful alike in its extent and in the inadequacy of the remuneration they received for it. Ayrton and Perry, in fact, were fully ten years before their time; their numerous patents expired in many cases ere their inventions had had the opportunity of making their true value appreciated, and a new generation arose which often failed to realise its immense indebtedness to these pioneers.

The latter portion of Prof. Ayrton's career is, however, better known to our readers; transferred to the Central Technical College of the City and Guilds Institute in 1884, he held the post of Professor of Electrical Engineering up to his death, and in that capacity he left upon the memory of thousands of students a vivid recollection of his impetuous energy, indomitable courage in the face of difficulties, and originality of thought.

His aim was always to train students to *think for themselves*—a feat which in these days, as he well knew, was far from easy. From his laboratories very many of our most talented engineers have emerged, and his name has been carried by them, and by his voluminous writings, which were marked by exceptional literary ability, to all parts of the world. His devotion to science did not hinder his regard for art and love of music, and Prof. Ayrton was formerly a constant attendant at the concerts of the Electro-Harmonic Society, being also a member of the Committee.

In 1901 the Royal Society awarded Prof. Ayrton a Royal Medal, and he received many other distinctions. In 1892 he was President of the Institution of Electrical Engineers, and for a long period he was Treasurer of that body.

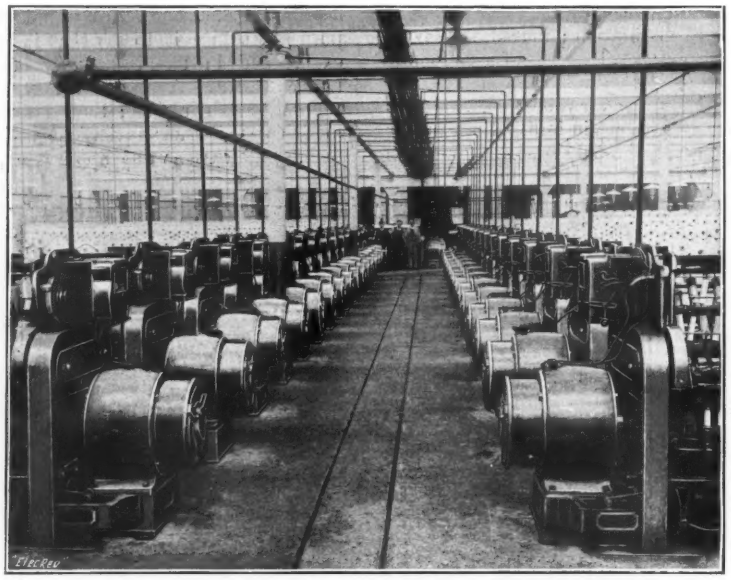
Prof. Ayrton was twice married. His elder daughter married Mr. Israel Zangwill in 1903; his younger daughter is unmarried. His widow, Mrs. Hertha Ayrton, has herself acquired distinction in the scientific world, her work on the physics of the arc being classical; and Mrs. Ayrton is the only woman member of the Institution of Electrical Engineers. To Prof. Ayrton's sorrowing relatives and associates we tender our sincere sympathy.

F

ELECTRICITY IN THE COTTON MILL.

It is only within the last two or three years that the English textile manufacturer has really awakened to the advantage of the electric drive—that is, if one may judge by published results. Even now one feels that he is, to a large extent, half-hearted in his enterprise; he still clings tenaciously to his shafting and belting where possible, even though disposed to do away with cumberous bevel gears, hidden in semi-solid grease, if old enough and sufficiently worn.

As to deviating from the modern steam plant with a spacious rope race attached—well, the engine house is usually the mill owner's fetish, and this may to some extent account for his hankering after the gods of his youth, especially when these have so frequently propitiated him in the form of this world's goods.



An Up-to-Date Electrically-Driven Doubling Shed.

This by the way; fortunately circumstances do arise occasionally when a really modern electrical drive appeals to the mill owner, a case in point being a recently-built doubling shed, erected by a well-known firm of fine cotton spinners and doublers. In this case electrical driving was only decided on after exhaustive tests had been carried out, and possibly an additional inducement was the fact that the firm had some 400 H.P. to spare on its driving plant at the original mills, which are situated a short distance away from the new shed.

It was decided to utilise some of this surplus power to drive a 120-KW. generator from the main engine, and this is supplemented by a 120-KW. Belliss "Mersey" steam generator; direct-current at 230 volts pressure, generated at the original mill, is transmitted some 50 yds. through lead-covered cables, laid solid, to the distributing boards in the doubling shed.

Another View of the Shed, showing 12-H.P. "Mersey" Motors and Switchgear Attached to the Frames.

The whole of the electrical equipment has been supplied and erected by Messrs. McClure & Whitfield, and as will be seen from our views of the shed, it provides an excellent

example of the modern individual drive, which has for some time been a feature of electrically-driven mills on the Continent.

The shed itself contains 50 doubling frames and the necessary auxiliary machinery; each frame is driven direct by a 12-H.P. "Mersey" motor, the starting and speed regulating switchgear being mounted just above the motor in each case. The auxiliary machinery is also electrically-driven by a 38 and a 35-H.P. motor. As the textile operations dealt with necessitate a very wide range of speed, variable speed motors were installed; these are all fitted with ball bearings, and are of the interpolar type.

Speed variation is of especial importance in this class of work, and the speed of any frame may be carried to the highest limit according to the particular work being dealt with at the time.

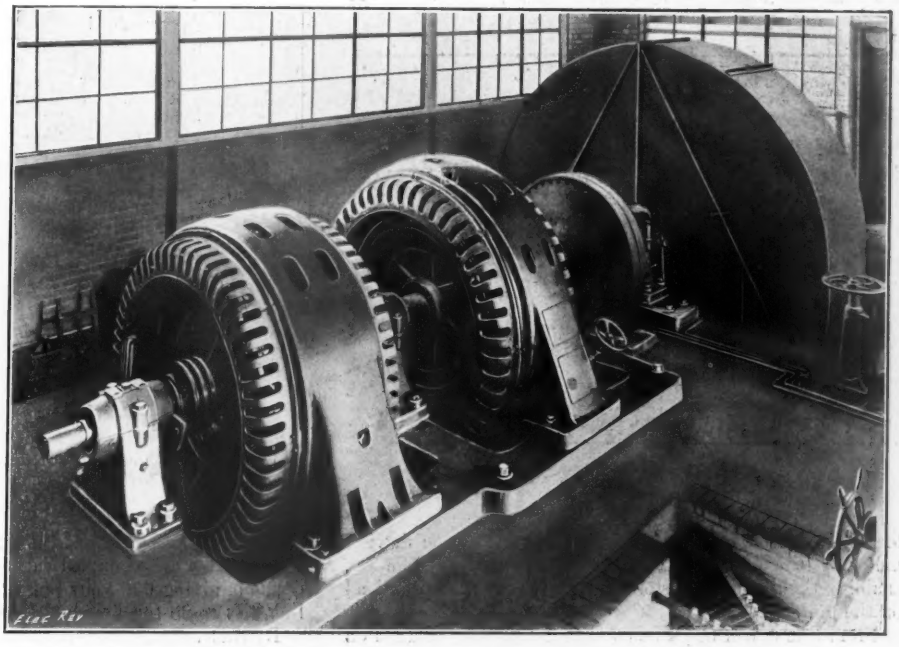
A reference to our views also demonstrates what can be achieved in the way of a bright and open shed, shafting, belting, &c., being conspicuously absent, in fact, in this case, a considerable saving was made in the shed structure, owing to the absence of shafting, &c.

Experience has already shown that the cost of running is abnormally low, and it is interesting to note that the proprietors are installing some thousands of additional spindles to be driven from another 150-KW. generating set.

In conclusion, we publish the views (p. 848) in order to demonstrate a somewhat unusual feature in English mill practice—the individual drive; we are indebted to Messrs. McClure & Whitfield for the photos. and particulars.

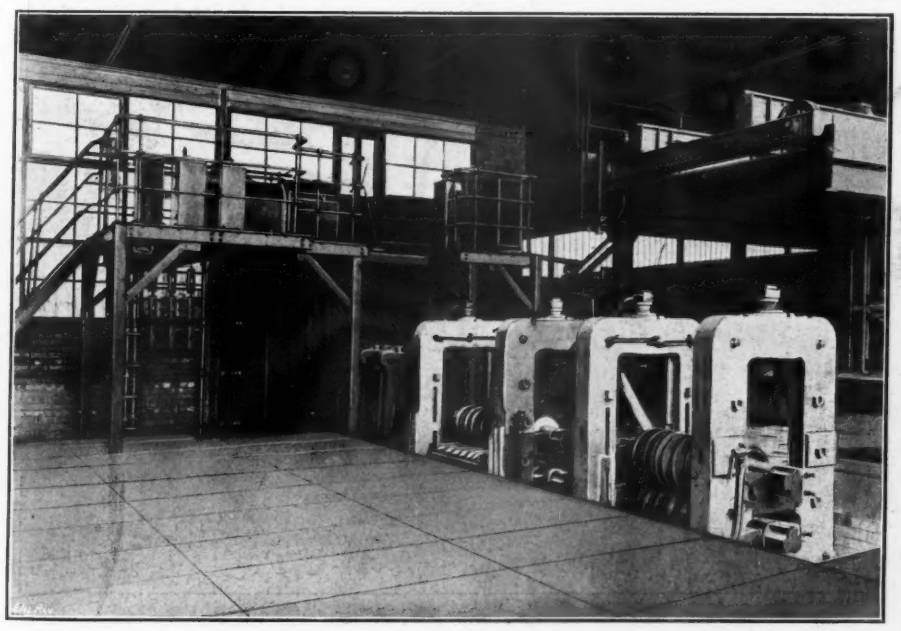
AN ELECTRICALLY-DRIVEN ROLLING MILL AT MIDDLESBROUGH.

AMONG the many satisfactory signs of industrial development in the North-Eastern district, few are more important, from the electrical engineer's point of view, than the adoption of electrical driving in connection with rolling mills.



ILGNER MOTOR-GENERATOR, MESSRS DORMAN, LONG & CO.'S ROLLING MILL.

Quite recently the Electrical Co., Ltd., equipped a large reversing rolling mill at Messrs. Dorman, Long & Co.'s Wire Mills, Middlesbrough, and through the courtesy of the former firm we are enabled to give some details of the installation.

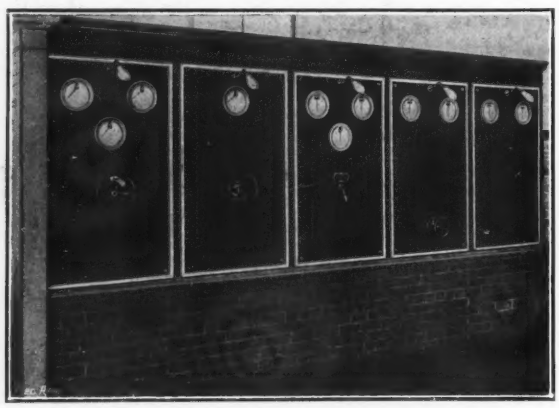


GENERAL VIEW OF ROLLING MILL, WITH CONTROL PLATFORM BEHIND.

The operation of the plant is on the well-known Ilgner system, in connection with the Ward-Leonard control; and this arrangement has so frequently been described that it is unnecessary to more than mention its salient features. The Ilgner set consists of a fly-wheel motor-generator, the generator—of the direct-current type—is coupled in series with the mill motor. The generator field is controlled by an exciter, and the variation or reversal of the small exciting current provides for the entire control of the rolling mill motor. The stored-up energy in the fly-wheel is made to neutralise the otherwise heavy current demands at periods of peak load on the mill, this being achieved by compulsorily decreasing the speed of the Ilgner set during such periods by means of a liquid resistance, automatically governed by a regulating motor, which intro-

duces resistance into the rotor circuit of the driving motor as required.

The torque exercised by the regulating motor varies with the main current; an increase of the latter to maximum value enables the regulating motor to lift the electrodes, and thus introduce the necessary resistance, while on the other hand, a decrease in the main current to a predetermined value—such as occurs when the mill runs empty at the end of a pass—decreases the motor torque, allowing the electrodes



The Main Switchboard.

to fall and ultimately short-circuit the rotor of the driving motor of the Ilgner set, which consequently speeds up, enabling the fly-wheel to store energy for the next peak load on the mill.

From this it will be gathered that the current demand on the mains is kept practically constant, despite the varying load of the mill motor.

The particular plant at Messrs. Dorman, Long's works operates a rolling mill containing two housings, with 16-in. diameter rolls, intended for rolling angles and small girders.

The mill is coupled to a compound-wound 600-volt motor of 1,200 H.P., with a maximum output of 3,600 H.P., and a varying speed of 0-110-160 R.P.M.; the maximum torque of the motor is 232,000 ft.-lb. A view of the mill is given on p. 849, the reversing mill motor being enclosed at the end.

The Ilgner set consists of a 950-H.P. motor operating

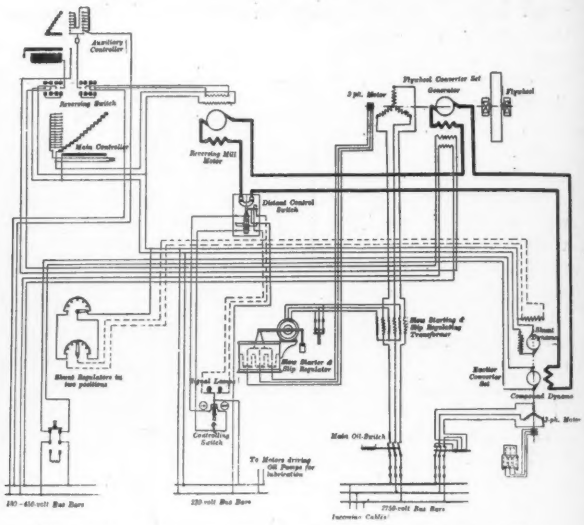
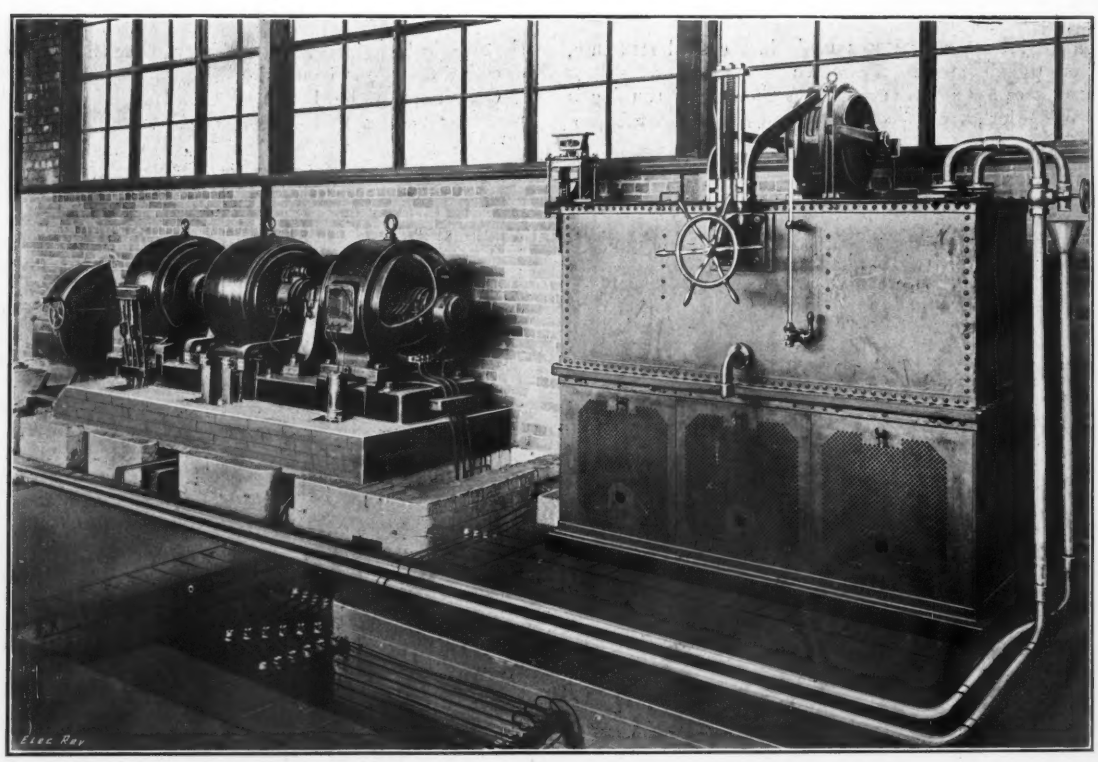


Diagram showing Connections of Ilgner Rolling Mill Plant.

on three-phase current at 2,750 volts pressure and 40 periods, and coupled direct to a 1,250-3,600 H.P. dynamo, giving 600 volts pressure, and attached by a coupling to two 20-ton fly-wheels mounted on a separate shaft.

By this arrangement it is possible to disconnect the fly-wheels in case they are not needed—*i.e.*, if the maximum demand of the rolling-mill motor at a certain work does not exceed 950 H.P.

The Ilgner set, which is illustrated on p. 849, runs at a maximum speed of 400 R.P.M., which speed is decreased by the automatically controlled resistance to about 350 R.P.M.



View of the Exciter and Liquid Resistance with Automatic Regulating Motor Mounted On Top.

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The energy for driving the set is taken from the mains of the Cleveland and Durham Electrical Power Distribution Co., Ltd.

The Ilgner generator is provided with compensating coils on the Déri system for the purpose of reducing the armature reaction, and thus securing absolutely sparkless commutation at all loads with a fixed brush position.

The bearings of the fly-wheel shaft are water-cooled, and the fly-wheels are housed in a massive sheet-iron case, in order to reduce the air friction, and accordingly the losses of the Ilgner set. All bearing are of the ordinary bush type, lined with white metal, and of very substantial dimensions, reducing the pressure per square inch to a very low figure. The lubrication is supplied by oil under pressure from either motor-driven pumps or an elevated tank, to which the oil is conveyed by motor-driven pumps. In case of emergency, hand pumps substitute the motor-driven ones.

An electric alarm is provided which calls the attendants' notice should the oil supply fail.

In order to start the Ilgner set with its heavy masses, a special barring gear is provided consisting of a 15-H.P. motor with the necessary gear, this being cut off automatically when the Ilgner set reaches a speed of 3 R.P.M. The fly-wheels, which are each 14 ft. in diameter, are equipped with powerful water-cooled brakes for the quick stopping of the set.

The exciter set consists of one three-phase motor, 80 H.P., 2,750 volts, 40 periods, coupled directly to two continuous-current dynamos, of which one serves to excite the fields of the Ilgner generator and the mill motor, and the other feeds a special compound winding on the mill motor, with the object of strengthening the field and thus decreasing the speed at sudden heavy overloads. Through this device the current during temporary overloads is kept within the limit for which the automatic circuit-breakers are set.

Our view on page 850 shows the exciter set, and the liquid resistance with automatic regulating motor mounted over it. The switchboard is of the enclosed cellular type, shown on page 850. The mill operator occupies a platform at one end of the rolls, and has a full view of the work which he controls; the platform carries a controller with a simple shunt rheostat specially designed for this class of work, also a small desk-shaped switchboard with instruments for informing the operator as to the speed and power consumption of the Ilgner set and mill motor.

The whole rolling mill is controlled by a single lever. It is interesting to note that the Allgemeine Elec. Ges., of Berlin, of which the Electrical Co. is the English representative, has carried out a number of similar installations on the Continent, some data relating to a few of which we reproduce herewith.

Firm.	Mill.	Finished material.	Weight, tons.	Section before entering rolls, mm.	Prolongation of material.	No. of passes.	Output per hour, tons.	Diameter of rolls, mm.	Method of coupling rolls to motor.	Max. torque in metre tons, mill motor.	Maximum output, H.P., mill motor.	Max. R.P.M., converter.	No. and weight of converter fly-wheels.	Normal output of converter motor, H.P.	Station supply current.
Austrian Coal and Iron Co.	4 housings	Rails 35 kg. Girders 45 cm. Billets 50 × 50 mm.	2 max.	380×380	43 times	23	15	750	Direct	78	9,000	375	Two 26 tons each.	2,500	A.C. 3,000 v. 50 cycles.
Austrian and Hungarian Imperial State Railways.	4 housings Cogging	Rails 35 kg.	1·6 max.	265×230	20 times	21	20	750	Direct	78	9,000	417	Two 26 tons each.	2,000	A.C. 5,200 v. 20·8 cycles.
	1 housing Plate mill	Girders 50 cm. Billets 50 × 50 mm.	3·5 max.	600×480 400×800 max.	4·75 times	19	30/35	950	Gear 2 : 1						
	1 housing	Plates 2,800 mm. broad, 6 mm. thick	3·5	400×980 max.	19 times	29	30	860	Gear 2 : 1	78	9,000	417	Two 26 tons each.	2,000	A.C. 5,200 v. 20·8 cycles.
	1 housing	Bars 1,000 mm. broad, 6 mm. thick	3·5		15 times	27	—	750	Direct						
Bombacher Hüttenwerke, Rombach.	Billet mill 2 housings	Billets 50 × 50 mm Sleepers	2·1	215×185	16 times	13	60/70	800	Direct	90	12,500	300	Four 25 tons each.	2,800	A.C. 5,500 v. 50 cycles.
Hüttener Gewerkschaft A. G. Husten.	Plate mill 2 housings	Tin bars 400 × 4 mm.	1·25	—	—	17	20	750	Direct	45	6,250	405	Two 26 tons each.	1,500	D.C. 500 v.
Aciéries and Forges de Firminy.	Cogging mill 5 housings	Billets 50 × 50 mm.	·5	300×300	36 times	21	4	700	Gear 2·6 : 1	40	3,750	400	Two 20 tons each.	800	D.C. 220 v.
	Armour-plate mill 1 housing	Armour-plate 1,500 × 2,500 × 200 mm.						1,100							
Dorman, Long & Co.	2 housings	Angles 75 × 75 mm. Girders 150 mm.	35	150×150 and 75 × 75	Varies 24 times	—	10	400	Direct	32	3,000	400	Two 20 tons each.	950	A.C. 2,750 v. 40 cycles.

Electric Shock.—An Exeter correspondent writes: "A young man who went from Tiverton by the last excursion to the White City last Saturday week put his finger on a "live" wire in a recess in a parapet in the Court of Honour and received a severe shock. The finger was burnt to the bone. The authorities gave the sufferer 50s. as a solatium."

Croydon Tramway Athletes.—The annual general meeting of the members of the Croydon Corporation Tramways Athletic Club was held at Thornton Heath depôt on 28th ult., when a large number attended, among them being Mr. T. B. Goodyer, A.I.E.E., tramways manager, president of the club, Mr. H. B. Harris, engineer, Mr. C. G. Foster, superintendent (hon. general secretary of the club), Mr. H. E. Smith, hon. treasurer, and others. The accounts showed a total revenue of £154, and the balance remaining in hand was £22, which was carried forward. It was generally admitted that the affairs of the club during the past year had been eminently satisfactory, largely due to the untiring efforts of the hon. general secretary.

Further Opinions Regarding the Manchester Exhibition.—"*Wires and Cables*" say that the Exhibition was one of the best, if not *the* best, electrical exhibition. Success greater than anticipated. Wires and cables brought before right people. It would have taken a very long time in the ordinary way to bring them before such a number of people as during the four weeks of the Exhibition. Large numbers of inquiries for wires and cables for all purposes, and some orders were actually booked in the Exhibition. The after effect should be good, though, owing to the depressed state of trade generally, it may be some time before the full benefits are realised.

"*Electric Lamps*" answer question (1) in the affirmative. Exhibition is expected to lead to orders in their case, though the good effect upon the electrical trade will not continue for a very long period.

"*Other Lamp Makers*" write in terms showing that they are delighted with the result, which has been a "surprise and wonder" to them. New calls and inquiries continually. Many orders for lamps obtained, some of them for large quantities. Many promises were received, and orders are expected. Confident that good effect will continue.

"*Arc Lamps*" report that the results of the Exhibition, so far as their experience goes, and speaking particularly as arc lamp manufacturers, are satisfactory. They have been brought into touch with a great number of probable buyers in the trade, and the Exhibition has also given them an excellent opportunity of interesting factory and mill owners, tradesmen, &c.

NOTES.

(*Continued from page* 846.)

What Allowance for Depreciation ? — In the United Kingdom the low-fare craze has been carried to excess, with a consequent drop in earnings which prevents many tramway undertakings being run as profitable concerns. But with all the shortcomings that may be witnessed, we have not here anything in any way approaching the state of things described in the following song that was written recently for an American Transportation dinner, but was not sung, as the dinner didn't come off. We are indebted to one of the *Electric Railway Journal's* daily editions, issued in connection with the Convention held last month, for the lines, which we print for the edification of some of our tramway readers:—

Tell me what's this awful object
  Comin' down the village street,
With a bumpin' and a thumpin'
  That it's difficult to beat:
With a rattlin' and a shakin'
  And the squeak of rusty steel,
With a dingy coat of varnish
  And a flat spot on her wheel?

Oh, her trolley pole is busted
  And it's fastened up with string;
Her armature's short-circuited;
  Her foot-gongs will not ring.
All her gears are worn to shadows,
  So she shrieks as she goes by
With a spavin on her fender,
  And her journal boxes dry.

And the road-bed there in Podunk,
  It would surely give you pain;
It is bulged by many winters,
  It is washed away by rain.
It has never had new ballast,
  It has never known repair,
And a single solid rail-joint
  Would make Podunk sit and stare.

Now, the cause of these conditions,
  'Twouldn't take you long to guess,
Though the village council members
  Wouldn't willingly confess:
For they passed an "8-fer" franchise
  And they knocked the earnings down—
So the trolley line in Podunk
  Is a black-eye to the town.

Birthday Honours.—In the list of Birthday Honours issued on Monday last, there are as usual few rewards that interest the electrical man. Sir C. B. McLaren, Bart., M.P., chairman of the Metropolitan Railway Co., and of leading iron, coal, and shipbuilding companies, is made a Privy Councillor. Mr. Luke White, M.P., whose name is chiefly familiar in electrical circles because of his services rendered as chairman of the London Electric Power Bills Committees, receives the honour of Knighthood. By far the most interesting announcement from our point of view, is that of the conferring of a Knighthood upon Prof. J. J. Thomson, D.Sc., LL.D., Ph.D., F.R.S., president-elect of the British Association for next year's meeting at Winnipeg, Cavendish Professor of Experimental Physics at Cambridge since 1884, and Professor of Physics at the Royal Institution since 1905. We tender our hearty congratulations to Sir Joseph John Thomson on this well-merited recognition of his services in the cause of science.

Electric Supply Cricket League.—The following are the particulars of the points scored during last season by the clubs affiliated to this League, from which it will be observed that the Kensington and Knightsbridge Cricket Club are the winners of the cup this season:—

Kensington and Knightsbridge Electric	18 points.
Central Electric	11 ,,
St. Pancras Power	11 ,,
St. James' Electric	10 ,,
City Electric	2 ,,
St. Marylebone	0 ,,

Mr. A. W. Seabright, hon. sec. and treasurer, 19, Cadogan Gardens, S.W., will be pleased to furnish electricity supply cricket clubs with any information they may desire to have in connection with the League.

Electric Fire-Control Circuits on Battleships.—The official electrical trials of the fire-control circuits and fittings (gun and torpedo) which have been recently installed in the battleship *New Zealand* at Devonport, were tested on Monday, with satisfactory results. The battleship has since left for Portland, and at an early date she will carry out the annual battle practice, when the new fittings will be put through further exhaustive trials.

Smoke Prevention Apparatus.—The Sheffield Federated Health Association are promoting an Exhibition of Smoke Prevention Appliances, to be held in the Corn Exchange, Sheffield, from March 1st to 20th next year. Any information will be gladly furnished by the Secretary of the Association, Mr. Wm. Bashforth, 45, Bank Street, Sheffield, who will act as secretary to the Exhibition.

The Davies Boiler Patents.—In the Chancery Division of the High Courts, on October 29th and 30th, the case of Davies *v.* Davies Patent Boiler, Ltd., was heard, and judgment was delivered. It was a claim by plaintiff that he was entitled to Patent No. 903 of 1907, free from all claims on behalf of the defendant company, and he sought an injunction to restrain the defendants from claiming the benefit of the patent, as their claim was hindering the negotiations for the disposal of the British patent. Defendants counterclaimed, seeking to establish that if the 1907 patent was an improvement on the 1903 invention they were entitled to all foreign patents in respect of it, irrespective of the date when the invention was made; but even if it was not an improvement it was still an invention, and was made during the period in which plaintiff was employed by the Premier Boiler Tubes, Ltd., and therefore they claimed the British patent and the invention under another clause in the agreement made between themselves and the plaintiff. In the course of his judgment, Mr. Justice Swinfen-Eady said that the counterclaim would be dismissed, and declared that the plaintiff, John Prothero Davies, was entitled to the Letters Patent No. 903 of 1907 free from all claims on the part of the defendant company, and that the defendant company were not entitled to any interest in any invention in relation to boilers or boiler tubes made by the plaintiff since November 14th, 1906. Defendant company were to be restrained during the continuance of the said patent from claiming the benefit thereof, and to be perpetually restrained from claiming any interest in any invention in relation to boilers or boiler tubes made by plaintiff since November 14th, 1906.

In regard to the above, we are informed that Messrs. Edward Le Bas & Co., of Dock House, Billiter Street, E.C., have now definitely taken over the Davies boiler patents which were in dispute, and Mr. Davies is now with them. They are about to place the manufactures under the patent on the market.

Scandinavian Water-Power.—An interesting survey of the natural water-power resources of Scandinavia and their commercial importance is furnished by a report of Mr. Sven Lübeck, a member of the Consulting Engineer Bureau for Water Works at Stockholm. The aggregate water-power of Sweden, Norway, and Finland, he says, amounts in round figures to 42,000,000 H.P., of which Sweden possesses 10,000,000, Norway 28,000,000, and Finland 4,000,000. The utilisable power aggregates 10,000,000 H.P., of which 4,000,000 falls to Sweden, 5,000,000 to Norway, and 1,000,000 to Finland, or in the ratio of 40 per cent., 18 per cent., and 25 per cent. of the actual powers respectively. The power at present utilised in works in existence, or projected, is only 220,000 H.P. in the case of Sweden, 220,000 in that of Norway, and 60,000 in the case of Finland. The largest developments of power production in Sweden are situated in the Lule Elf, 240,000 H.P.; in the Angerman Elves, 455,000 H.P.; in the Dal Elf, 320,000 H.P.; and in the Gota Elf, 150,000 H.P. In Norway the largest power producers are the River Glomen, which affords an available power of 1,100,000 H.P.; the Drammen Elves, 500,000 H.P.; and the Aura Elf, 90,000 H.P. Finland's great water-power plants are the Wuoksen, 300,000 H.P.; and the Ule Elf, 150,000 H.P.

Electrical production is greatly favoured by the fact that the numerous lake basins are generally situated in the middle of the courses of the rivers, thereby affording easy and cheap control of the flow, with increase in the heights of the falls. Thus, in Norway, heads of 10 to 15 m. can be utilised; in North Sweden, 5 to 8 m.; in South Sweden and Finland, 1·5 to 2 m. In South and Middle Sweden, the water-power has the advantage of being situated near the sites of consumption. On the other hand, the utilisation of the water-power of North Sweden, Finland and Norway involves, for the development of their ore deposits, the construction of railways, for which the first and last countries have already drawn up plans. Norway is particularly well placed, owing to the great height of its falls, low control and construction cost, and a purchase price ranging from 50 to 100 kr. per H.P., against 200 kr. in Sweden. In South and Middle Sweden, in consequence of the local circumstances, the utilisation of even small falls of 2 to 3 m. can be carried out very economically. In these areas the power generated is devoted to electric lighting, railway working and town industries; more particularly, owing to the low cost of the energy, to the production of chemicals, and notably sulphuric acid; also to wood working and iron smelting.

The economic value of these water-power resources has, so far as the latter have been developed, already been demonstrated by its influence on the imports and exports of the respective countries. Mr. Lübeck estimates its probable effect on Sweden's future commercial position when 1,300,000 H.P., or one-third of its utilisable power resources, are brought into operation. The coal imports in the year 1904, totalling 4,000,000 tons and yielding 700,000 H.P., will, he says, be reduced by the employment of 400,000 hydraulic horse-power for light and power purposes, from 60,000,000 kr., to 30,000,000 kr., the import of manures, now to a value of 11,000,000 kr., will, by the use of 500,000 H.P. of electric energy for their local manufacture, not only wholly cease, but be changed into an export of 15,000,000 kr. worth; the import of iron and steel will be lessened by the diversion of 200,000 H.P. to iron and steel smelting, worth from 32,000,000 kr. to 11,000,000 kr. The present export of iron goods to the value of 49,000,000 kr. will be increased to 89,000,000 kr., while the production and export of paper pulp will be augmented from 41,000,000 kr. to 70,000,000 kr. Furthermore, new industries will be founded as the outcome of cheap motive power, involving additional exports of 40,000,000 kr.—all these factors tending to enlarge the national trade balance by a sum of 21,000,000 kr. yearly in the near future. Similar stimulation will be afforded to the commercial expansion of the other Scandinavian countries.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—Mr. S. Cameron Gibson, borough electrical engineer, Nuneaton, was presented with a silver electric kettle and electric water-heater by the staff at the electricity works, on the occasion of his marriage, which took place recently. He was also the recipient of a marble chiming clock, suitably engraved, presented by the Town Council's officials and staff.

Mr. S. A. Lovick, canvasser in the Fulham Borough electricity and lighting department, has sent in his resignation, and it has been accepted.

Mr. E. Mudd has resigned his position at the Sheffield tramways power station, in order to take up a post with the Cleveland and Durham Electric Power, Ltd.

Mr. F. H. Minchin, senior switchboard attendant of Horsham, has been appointed junior assistant at Leek.

General.—At the annual statutory meeting of the Glasgow T.C., following upon the November election, ex-Bailie James Macfarlane was reappointed convener of the Tramways Committee and Bailie W. F. Russell sub-convener. Deputy-River Bailie J. W. Stewart was chosen as convener of the Electricity Committee, with ex-Bailie James Willock as sub-convener. Mr. W. C. Martin (of Messrs. W. C. Martin & Co., electrical engineers), Glasgow, has been returned to the Glasgow Town Council as representative for Anderston Ward, by a big majority.

Obituary.—F. A. C. Perrine.—We regret to learn from our trans-Atlantic contemporaries of the death of Mr. Frederic A. C. Perrine, D.Sc., a leading American authority on long-distance power transmission, at the early age of 46 years.

NEW COMPANIES REGISTERED.

Garonne Valley Electric Supply Co., Ltd. (100,155).—This company was registered on November 4th, with a capital of £22,500 in £1 shares, to carry on the business of electrical engineers, electricians, engineers, contractors, suppliers of electricity, manufacturers of electrical apparatus, &c. The subscribers (with one share each) are:—A. Deby, 19, Gracechurch Street, E.C., civil and mining engineer; L. Deby, 19, Gracechurch Street, E.C., civil engineer; C. F. S. Wright, 88, Bishopsgate Street Within, E.C., merchant; G. F. Wallace, 61-2, Gracechurch Street, E.C., merchant; W. M. Edwards, 5, Earl's Court Gardens, S.W., gentleman; C. V. Joly, 6, Blundell Street, N., manufacturer; G. C. Pascal, Belgrave Villa, Belgrave Road, Wanstead, merchant. Table "A" mainly applies. Secretary, L. Deby. Registered office, 88, Bishopsgate Street Within, E.C.

R. J. Mecredy, Eaton & Davidson, Ltd. (3,365).—This company was registered in Dublin on October 30th, with a capital of £5,000 in £1 shares, to carry on the business of electrical engineers, &c. The subscribers (with one share each) are:—R. J. Mecredy, Vallambrosa, Bray, Co. Wicklow, journalist; R. N. Eaton, 54, Sidney Avenue, Blackrock, Co. Dublin, electrical engineer; H. S. Davidson, 6, Wyndham Park, Bray, Co. Wicklow, electrical engineer. Private company. The number of directors is not to be less than three or more than five; the first are R. J. Mecredy, R. N. Eaton, and H. S. Davidson; qualification, 250 shares; remuneration, £150 per annum each. Registered office, 49, Middle Abbey Street, Dublin.

Imperial Brake Block Co. (of Great Britain and Ireland), Ltd. (100,163).—This company was registered on November 5th, with a capital of £20,000 in £1 shares, to acquire certain patents for inventions in relation to brake blocks for railway and other rolling stock, and to adopt an agreement with the European Brake Shoe Co., of New Jersey, U.S.A. The subscribers (with one share each) are:—W. N. Schoff, 29, Great St. Helens, E.C., merchant; R. H. Liley, 29, Great St. Helens, E.C., manager. Private company. The number of directors is not to be less than two or more than seven; the first are W. D. S. O. H. Cutler (? W. D. Sargent, O. H. Cutler), W. Whittam and W. N. Schoff; qualification, 20 shares; remuneration as fixed by the company. Registered office, 15, Cross Street, Manchester.

Regent Electric Co., Ltd. (100,189).—This company was registered on November 7th, with a capital of £100 in £1 shares, to carry on the business of manufacturers of and dealers in "Holmquist" and other electric light baths, mercury vapour lamps, and their appliances, electrical engineers, &c. The subscribers (with one share each) are:—C. M. Holmquist, 52, Regent Street, W., electrical engineer; H. Curry, 9, Priory Grove, South Kensington, S.W., electrician. Private company. Table "A" mainly applies. Registered office, 46, Irongate Wharf Road, Paddington, W.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Underground Electric Railways Co. of London, Ltd. (73,376).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Agreement dated 1908, securing £58,189 18s. 7d.

British Tramways and General Construction Co., Ltd. (78,034).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Mortgage or charge dated 1905, securing £21,189 15s. 9d.

British Aluminium Co., Ltd. (41,104).—A memorandum of satisfaction, to the extent of £187,672 of debentures dated November 30th, 1899, securing £300,000. A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Charges dated 1899 and 1908, securing £430,745.

Northallerton Electric Light and Power Co., Ltd. (59,301).—Particulars of £5,000 debentures created by resolution of December 11th, 1900, have been filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of the present issue being £260. Property charged: The company's assets, present and future, including uncalled capital. No trustees.

A. Reyrolle & Co., Ltd.—Particulars of £20,000 debentures created by resolution of April 17th, 1907, have been filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of the present issue being £500. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Notting Hill Electric Lighting Co., Ltd. (25,921).—A trust deed dated September 29th, 1908, to secure £50,000 second debenture stock issued jointly with the Kensington and Knightsbridge Electric Lighting Co., Ltd., has been registered. Property charged: Freehold land and generating station with fixed plant and machinery thereon, near Wood Lane, Hammersmith. Trustees: R. E. B. Crompton, Thriplands, Kensington Court, and A. E. Franklin, 21, Cornhill, E.C. A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Floating charge dated June 17th, 1897, and securing £64,000, and charge dated July 12th, 1900, securing £100,000 debenture stock.

Kensington and Knightsbridge Electric Lighting Co., Ltd. (26,193).—A trust deed dated September 29th, 1908, to secure £50,000 second debenture stock issued jointly with the Notting Hill Electric Lighting Co., Ltd., has been registered. Property charged: Freehold land and generating station with fixed plant and machinery thereon, near Wood Lane, Hammersmith. Trustees: R. E. B. Crompton, Thriplands, Kensington Court, and A. E. Franklin, 21, Cornhill, E.C.

Mexico Electric Tramway, Ltd. (56,932).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Trust deeds dated 1898 and 1899, securing £400,000.

Electrical Development and Finance Corporation, Ltd.—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Mortgage dated 1900, securing £13,209 10s. 5d.

Leamington and Warwick Electrical Co., Ltd. (13,780).—Particulars of £35,000 debentures created by resolutions of September 21st, 1906, and July 20th, 1908, have been filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Thomas Parker, Ltd. (40,973).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Debentures dated 1898, securing £58,000.

Brush Electrical Engineering Co., Ltd. (29,533).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Debentures dated 1892 to 1908, securing £328,297 13s. 1d.

Cleveland and Durham Electric Power Co., Ltd. (89,539).—Particulars of £150,000 second debentures, created by resolution of August 10th, 1908, have been filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of the present issue being £19,500. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees. Also issue on October 6th of £6,500, on October 8th of £10,000, and on October 13th of £1,500 debentures, part of a series of which particulars have already been filed.

Electric and General Investment Co., Ltd. (London) (31,506).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date, and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Charge dated 1900, securing £10,000.

Fleetwood and District Electric Light and Power Syndicate, Ltd. (19,666).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Trust deed dated 1899, securing £7,239 3s. 2d.

Johnson-Lundell Electric Traction Co., Ltd. (65,699).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Mortgage or charge dated 1906, securing £4,070 14s. 6d.

Costa Rica Electric Light and Traction Co., Ltd. (56,447).—Particulars of £15,000 debentures, created by resolution of July 1st, 1908, and secured by a trust deed dated October 16th, 1908, have been filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the whole amount being now issued. The above-mentioned trust deed has also been registered. Property charged: The company's undertaking and property, present and future, including uncalled capital. Trustees: City Safe Deposit and Agency Co., Ltd., 13-15, Throgmorton Avenue, E.C.

Maxim Electrical Co., Ltd. (Westminster), (84,426).—A charge dated October 29th, 1908, to secure £500, has been registered. Property charged: The company's general assets, present and future, has been registered. Holders: Barclay & Co., Ltd.

Julius Sax & Co., Ltd. (Electricians, London), (63,371).—Particulars of £2,500 debentures, created by resolution of October 23rd, 1908, have been filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of the present issue being £1,500. Property charged: The company's general assets. No trustees.

Northern Electrical and Ventilating Co., Ltd. (Liverpool).—Debentures dated October 23rd, 1908, to secure £1,000 charged on the company's general assets, have been registered. Holders: C. P. L. Titherley, Langtree, Piercefield Road, Formby, near Liverpool; A. W. Titherley, D.Sc., Southcot, Upton Road, Moreton, Ches.; and Miss M. C. Titherley, The Limes, St. George's Road, Wallasey.

Stratford-on-Avon Electricity Co., Ltd. (86,502).—A mortgage dated October 3rd, 1908, to secure £3,000, charged on the company's property, present and future, including uncalled capital, has been registered. Holders: J. Stevenson, Stratford-on-Avon; and F. J. Hughes, 2, Woodbourne Road, Edgbaston.

West India and Panama Telegraph Co., Ltd. (11,116).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date, and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Debentures dated 1892, securing £80,000.

Mountain & Gibson, Ltd.—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Mortgages dated 1905 and 1908, securing £24,584 7s. 9d.

Jandus Arc Lamp and Electric Co., Ltd. (Manchester) (43,898).—A statement of the total amount outstanding on July 1st in respect of mortgages and charges created prior to that date and not required to be registered under Sec. 14 of the Companies' Act, 1900, has been filed pursuant to Sec. 12 of the Companies' Act, 1907. Particulars: Charge dated 1899, securing £5,500, and debenture dated 1900, securing £2,500.

British Power Co., Ltd. (64,780).—A trust deed dated September 16th, 1908, to secure £12,530 second debenture stock has been registered. Property charged: The company's undertaking and property, present and future, including uncalled capital, subject to prior charges. Trustees: A. T. Ashwell, St. Peters Gate, Nottingham, and R. T. Smith, 4 and 6, Copthall Avenue, E.C.

W. H. Allen, Son & Co., Ltd. (66,440).—This company's annual return was filed on September 7th, when 151,400 shares had been taken up out of a nominal capital of £200,000 in £1 shares. £1,400 has been received, and £150,000 is considered as paid. Mortgages and charges: £48,000.

Electric Supply Company of Victoria, Ltd. (66,059).—This company's annual return, made up to August 21st, was filed on September 2nd. Capital, £300,000 in 150,000 preference and 150,000 ordinary shares of £1 each, of which 135,000 preference and 125,000 ordinary are taken up. £10,007 has been paid on 10,007 ordinary. £249,993 is considered as paid on the remainder. Mortgages and charges: £167,965.

Leicestershire and Warwickshire Electric Power Syndicate, Ltd. (72,274).—Issue on October 22nd of £150 debentures, part of a series of which particulars have already been filed.

River Plate Electricity Co., Ltd. (75,569).—Particulars of £250,000 debentures created by resolution of December 18th, 1908, and secured by a trust deed dated January 8th, 1908, have been filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of the present issue being £5,316 (making a total now issued of £200,000). Property charged: The company's general assets. Trustees: River Plate Trust, Loan and Agency Co., Ltd.

Electrolytic Refining of Bullion.—The United States mints have been equipped with electrolytic apparatus for refining their metals; Philadelphia first, then Denver, and now San Francisco. In a recent volume of the *E. M. I.* (Vol. VI), the following interesting details of the latest installation are given. The Wohlwill process for refining gold is used, as in all the other mints. For this equipment 30 porcelain tanks, 18 in long, 13 in. wide and 12 in. deep, are arranged on a 2-in. stone table in two rows of 15 tanks each. The circulation is obtained from an individual flow from a porcelain trough, which is supplied from a jar 36 in. × 24 in. in diameter. The latter receives the discharge from a porcelain plunger pump made to withstand the chemical action of chloride of gold solution containing free hydrochloric acid. The anodes and cathodes are ⅜ in. apart, requiring only 1 volt per tank to maintain 450 amperes. This gives a current density of 105 amperes per sq. ft. of cathode surface, giving an output of gold per 24 hours per tank of 650 to 670 oz. The best run for one week with 20 tanks in circuit was 13,500 oz. per day. The fineness of the cathodes averaged 999·5. The purity of the anodes varied from 880 to 950 ing old, and anodes having as much as 100 parts of silver have been worked successfully, producing gold 999 in fineness.

The silver tanks are of German earthenware, and a similar arrangement of circulation is employed. The tanks are 24 in number; they are 39½ in. long, 19½ in. wide, 12 in. deep, and are arranged on a 2-in. stone platform. The anodes are made up of 330 to 333 parts of gold, not over 100 parts base, and the remainder silver. The electrolyte contains from 1 to 2 per cent. free nitric acid, 3½ to 4½ per cent. silver, besides lead, copper, bismuth and zinc. As the anodes are very base, about 5 per cent. by volume is drawn off each day, and an equal volume of solution rich in silver added. The current density in each tank is 50 amperes per square foot of anode surface. The deposited silver runs uniformly about 999·5 in fineness. Both the anode slimes and the foul liquors are worked up separately. In the old system, the copper solutions were thrown away, but at San Francisco they are worked up for both copper and platinum. This is done in three lead-lined tanks, 36 in. long, 18 in. wide and 18 in. deep. The platinum obtained in this manner amounts to 400 oz. per year. During three months' operation of the refinery, 500 lb. of copper were recovered from the gold alloy. From this copper 112 oz. of platinum and iridium were obtained. The slimes obtained from the copper electrolysis produced a bar assaying 83 parts of platinum per 1,000 oz. This represents a concentration from 1,075,000 standard oz. of gold, which would make less than one-tenth of a part per 1,000 oz. The entire operation, from start to finish, is electrolytic. The whole plant is worked by four motor-generator sets. Two of these produce 1,000 amperes at 15 volts, one each for gold and silver; one set for gold chloride electrolysis gives 500 amperes at 25 volts, and one set for copper gives 200 amperes at 6 volts. Each set is built for voltage regulation so as to obtain the maximum load in amperes from 5 to 15, from 5 to 25, and from 2 to 6 volts. The switchboard consists of seven panels of acid-proof stone, three motor panels and three generator panels, with one panel for controlling the auxiliaries in the refinery. The total length of board is 15½ ft., and it is 8 ft. in height.

CITY NOTES.

Western Telegraph Co., Ltd.

Sir John Wolfe Barry presided on Wednesday at Electra House over the seventieth ordinary general meeting of the above company.

In proposing the adoption of the report (see Electrical Review, November 6th, 817) and accounts, the Chairman said that during the half-year under review the depression in trade and commerce which prevailed in other parts of the world had apparently not spread to South America with, perhaps, the exception of the West Coast. The financial position of Chile was in a somewhat unsettled condition, and one of the competing cable companies had also opened another station on that coast, and had improved its service generally by the submergence of a new and more direct cable. The result, however, on the whole of their system, was that the total message receipts showed an improvement of nearly £23,000, and the gross revenue an increase of £26,500 over the corresponding period of 1907. Since July 1st there had been a distinct reaction in the traffic earnings, and to the present date they had fallen off by about £15,000, compared with those of the corresponding period of last year. The decrease was not confined to any particular part of the South American Continent, although it was rather more apparent in the district where there was less telegraphic competition, which led one to conclude that trade generally was not so flourishing as in the earlier part of the year. In the past few weeks, however, there had been signs that things were better. The working expenses for the half-year were increased by £2,613, principally under the heads of maintenance of cables and income-tax. The result to the shareholders was that the quarterly interim dividend, amounting to £31,189 10s., had been paid: £110,000 had been transferred to the general reserve fund, £5,000 to the maintenance of ships reserve fund, £10,000 to the Marine Insurance fund and £10,000 to the land and buildings depreciation fund. The directors now recommended the declaration of a final dividend of 3s. per share, making with the interim dividends a total dividend of 6 per cent. for the year; also the payment of a bonus of 2s. per share, both free of income-tax, which, together, would amount to £51,982, leaving a balance of £4,259 to be carried forward. They would be interested to know that the amount set aside as provision on account of investment fluctuation was still about sufficient to meet the depreciation of stocks if they were realised at the lowest present market prices. He was sorry to say that they would before long have another competitor between Europe and South America, as a German Submarine Cable Co. had obtained a concession from the Brazilian Government for landing a trans-Atlantic cable, and one of the conditions was that the cable should be laid within the next 3½ years.

Sir John Denison Pender seconded the motion.

The Chairman said that before putting the motion, he would mention that when the companies were amalgamated seven years ago a gentleman named Cliff was compulsorily retired, and he had from time to time since forwarded elaborate criticisms of the policy of the directors. He had given notice that at that meeting he would move for a committee of shareholders to be appointed to inquire into the working of the company. He believed Mr. Cliff was not present, and in the circumstances he thought he should have been.

The report was then adopted.

Rio de Janeiro Tramway, Light and Power Co., Ltd.

The report for the year ended December 31st, 1907 (as quoted in the *Financial Times*), states that the matter of greatest interest dealt with during the past year was the revision of the concessions of the Sao Christovao, Carris Urbanos and Villa Isabel Tramway Companies, heretofore operating under different conditions, and each with its own gauge of track. By a new contract with the Municipal Council the three companies operate under similar conditions, the concessions have been extended until 1970, and until 1940 these companies will have the monopoly of the tramway service in a large area of the city, comprising about three-fourths of the urban part of the Federal district, and embracing that portion where the development for residential and manufacturing purposes will be greatest. The three systems will have a standard gauge of 4 ft. 8½ in., the same as that at present used on the Villa Isabel lines. This company was originally organised with a capital stock of $25,000,000 and a first mortgage bond issue of $25,000,000. Further large expenditure being necessary, the board on March 29th, 1908, authorised the issue of £3,500,000, or 88,060,000 fr. of 50-year 5 per cent. mortgage bonds, dated April 1st, 1908. Notwithstanding the financial crisis, the construction work in Rio has been continued without interruption, largely with funds provided through loans from banking institutions. The company has sold 22,500,000 fr. of the new issue in Paris and Belgium, and a further £900,000 in England. The proceeds are being used in the payment of the floating debt, the completion of the work in hand and further construction. The company still has in the treasury about £1,700,000 of this second issue, the proceeds of which will be applied to the electrification of the tramways, the reconstruction of the gas works, the extension of the telephone, light and power systems and other works of construction. In connection with the purchase of the Villa Isabel tramway and telephone systems, to secure a loan of $3,500,000 (which amount was guaranteed by this company), the entire issue of the bonds of the Villa Isabel Tram-

ways Co., amounting to $6,000,000 par value, has been deposited, and on account of advances made by this company in connection with this purchase and the guaranty above-mentioned, this company will be entitled to the proceeds remaining from the sale of these bonds after the payment of the above-mentioned loan. So far as the gas, telephone and tramways are concerned, the Rio Co. controls these properties through the ownership of shares and bonds of these companies, and in consequence their earnings do not appear in the financial statements of this company. As this company was passing through its construction period it was agreed with the subsidiary companies to operate same separately until December 31st, 1907. The net earnings of these companies were retained by each company and devoted by them to various construction purposes, thus relieving this company of the necessity of providing funds for such construction. From January 1st, 1908, the company receives the entire earnings from all these properties in virtue of agreements made with the company by the subsidiary companies. The general financial conditions of Brazil are good, and since the new monetary legislation providing for the fixation of exchange, was passed, the rate has been almost constant at a fraction above 15d. per milreis. Total net tramways earnings were $1,360,678; telephone, $47,758; light and power, $229,599; and gas company, $489,690; making total net earnings of $2,127,726. For the half-year ended June 30th the gross earnings from all services were $3,339,915, net $1,206,706.

Eastern Extension, Australasia and China Telegraph Co., Ltd.

Sir John Wolfe Barry, K.C.B., presided on Tuesday at Electra House, E.C., over the half-yearly meeting of this company.

In moving the adoption of the report (see Electrical Review, November 6th, p. 816), the Chairman said the gross revenue for the half-year under review was £290,000 as compared with £304,000 for the corresponding period of 1907, showing, therefore, a decrease of £14,000 which they held to be due to the commercial depression that appeared all over the Far East about a year ago, and which, unfortunately, still prevailed. Even with Australia, where good rains and other favourable conditions had continued, there was a falling off during the half-year, although they had managed to hold their own fairly well in the keen competition which was still going on with the State-owned British Pacific cable at the cost to the Governments concerned of some £62,000 a year—a very unfair competition in his opinion. The working and other expenses amounted, in round figures, to £151,000 against £156,000 for the corresponding period of 1907, showing a decrease of £5,000. This decrease was almost entirely accounted for by the expenses attendant on maintenance of cables being less in the past half-year than in the corresponding period. The net profit for the half-year was £120,000, and after adding £20,000 brought forward, there was an available balance of £140,000. The usual quarterly dividend of 2s. 6d. per share, or at the rate of 5 per cent. per annum, was paid for the half-year, leaving a balance of £66,000 to be carried forward. The general reserve had been debited with the cost of the Java-Cocos cable, amounting to £78,944, together with £8,762 for partial renewals to cables carried out during the half-year. The concession obtained from the Tasmanian Government nearly 40 years ago, giving the exclusive right to work between Tasmania and Victoria, would expire early next year, and the Australian Government, who, since the Commonwealth was established, had controlled all the telegraphs in Australia, had decided to lay and work cables of their own between Tasmania and the mainland, so they would have to close their Tasmanian station, and take up their cables unless an arrangement was come to with the Government. This, he feared, was remote, for they had received from that Government nothing but unfair competition and continuous attempts to oppress the company. He might also mention that they had had to resort to legal proceedings against the Australian Government to recover the difference between the value of the messages passing over the Tasmanian cables and the tariff fixed, and the amount of the guarantee agreed to be paid to the company in the event of the traffic falling short. When this arrangement was entered into, power was given to the Government to reduce the tariff from time to time, and this power was exercised until the tariff was reduced to ½d. a word, which was considered to be the minimum applicable to the circumstances. Towards the end of 1906, however, the Government arbitrarily passed an Order in Council abolishing the tariff, and from that time refused to pay the company anything on account of the traffic beyond the amount of the guarantee. As the company could not admit the Government contention that the power to reduce involved the power to abolish the rate, it was decided to submit the case to the Australian High Court, and arguments were exhaustively stated on either side, with the result that the Government's action was declared to be illegal by three out of the four judges who heard the case, and the company's claim was ordered to be paid in full. The Government had since notified the company that they had reduced the tariff from ½d. to ¼d. per word, which, they contended, was unreasonable and unwarranted by any circumstances, but as it could only apply from the date of notification until April, even if it were legally binding, the amount of revenue involved was comparatively small. This was but one more instance of the unfair and hostile treatment which the company had received at the hands of the Australian Government since the British Pacific cable was established.

The Marquess of Tweeddale seconded the motion, which was carried.

Mr. Newton, in proposing a vote of thanks to the directors, said he supposed they were only reconciled to the attacks being made on property by the fact that everyone else was suffering in the same way. Governments seemed to delight in putting obstacles in the way of the development of the trade of a country, and he believed this socialistic attitude was the cause of a great deal of the unemployment. From what he saw as to a universal 1d. a word rate for cables, it looked as if they were in for another attack.

The motion having been carried, the Chairman said he had not dealt with the question of 1d. a word rate until he really saw what the proposition was. When he saw that he would be able to deal with it at a meeting of one of the associated companies.

Victoria Falls Power Co., Ltd.

The Marquis of Winchester (president) took the chair at the annual general meeting of this company, held recently at Salisbury House, E.C.

The Chairman, in moving the adoption of the report (see Electrical Review, October 16th, page 664), said that during the period which had elapsed since the company was formed they had more than fulfilled the expectations which were held out in the prospectus. Their cash capital was provided by the issue in equal amounts of shares and debentures, and they had now issued £800,000 5 per cent. first mortgage debentures. At the date of the accounts only £175,000 of this amount had been issued, being part of the consideration paid to the Rand Central Electric Works, Ltd., for the purchase of that company's plant and undertaking in South Africa. The remainder, £625,000, was subscribed for and allotted in July, under the arrangement set forth in the prospectus. With regard to revenue and expenditure, after the deduction of interest on debentures and London expenses, there was a net revenue from the Brakpan and Germiston Works amounting to £36,686, which had been carried forward. The sums owing by various debtors, which amounted to £98,953 at December 31st, had all since been received. Their expenditure on capital account which had been continued throughout this year, as was to be expected, had been heavy. Their contractors had done exceedingly good work. They had pushed on construction at a very rapid pace, and though during the present year their demands upon the company had been incessant, they had had no cause to complain, because one of their new stations was already producing revenue, and they had every confidence that the other would follow suit early in the coming year. A most important statement which he was justified in making, was that the capital estimates upon which they had worked from the outset had been proved by events to have been correct, and they now knew that upon their original programme of construction they would have a larger margin than they at first anticipated. In South Africa they had every confidence that their most capable general manager, Major Bagot, would not lose any opportunity of furthering their interests. For the moment all the power which they could supply was sold, and he was confident that the whole output of the Simmer Pan station also would be contracted for shortly. In anticipation of further extensions in the future, they were applying for a private Bill in the next session of the Transvaal Legislative Council, in order to enable them when they wished to do so, to erect a station at Vereeniging on the Vaal River, and they were retaining the site which they had acquired near to the Rotherville Dam. To sum up their position, he might say they had firmly established themselves upon the Rand; that they would shortly be delivering electrical power from two large modern plants, of which one was already earning revenue; that their estimates of cost had not been exceeded; that they had entered into satisfactory contracts in regard to their supplies of coal; that they had large cash balances, and that their affairs in South Africa were in most capable hands. Besides this they had the Falls in reserve. They were a most valuable asset, and in any estimate of the company's position must never be lost sight of. They were confident that they now occupied a very strong position, both financially and otherwise, and he desired to emphasise this point because there had lately been circumstantial rumours in regard to the proposed formation of a company to compete with them in the supply of power on the Rand. Their attitude was a determination to oppose this talked-of attack upon their interests by every means in their power. They might be wrong, but he for one could not believe, in spite of the positive statements which had been circulated, that either underwriters in the first place, or private investors in the second, would support a competitive scheme of this character. Why should they? The game could not be worth the candle. They did not propose to surrender any of the position which they had secured upon the Rand without a struggle.

Mr. H. Wilson Fox, in seconding the motion, said that, as they knew, the policy of the company was to turn to a profitable account at the earliest possible moment the great reserve of power at the Victoria Falls. They would do all they could to promote the interests of the shareholders. They were endeavouring to arrange for the establishment of metallurgical industries at the Falls, without, however, interfering with the primary object of the transmission of power from the Falls to the Rand. With regard to Witwatersrand, there seemed to be a considerable amount of misconception, and, he was afraid, misrepresentation in the matter. The company had nothing to conceal, and they had never altered their views. First they had to get the grant of wayleaves from the Transvaal Government, and secondly, the certainty of the requirements for the power. With regard to the first point, they had, of course, at first considerable opposition to the proposals of the company on the Rand. He had had interviews with prominent men of the Government, and had told them that he was aware that the Government had the power to stop them, but he asked that for the present they should give them their support, and let the future take care of itself. They had received nothing

but the most considerate terms from the Transvaal Government. When they had sufficient demands to justify their taking the power to the Rand, they would go to the Government again. He had told the gentlemen that when that time arrived he was confident that they would allow their great enterprise to be carried out. As regarded the certainty of the market, the minimum extent of the market depended upon the relative cost of the steam-produced power and the water-produced power. He believed that the limit of the voltage was not yet reached. He fully anticipated that before many years passed it would be possible for power to be transmitted from the Victoria Falls to the Rand at a much less rate than for the same amount of power from 150 miles. They preferred small returns from a large market rather than a high return from a small market and their charges would always be framed on that policy. He would ask them to rely upon the directors to protect their interests in every possible way, and maintain the magnificent position which they had now secured.

The report was adopted.

West India and Panama Telegraph Co., Ltd.

The directors' report for the six months ended June 30th, 1908, shows that the amount to credit of revenue is £39,734, against £43,833 for the corresponding half-year of 1907, and the expenses have been £27,567, against £30,029. The result is, therefore, a balance of £12,167, to which is added £1,579 interest on investments, and £557 brought forward from last account, making an available total of £14,302. The directors propose that this amount be dealt with as follows:—First preference shares, dividend of 6s. per share, six months to June 30th, £10,369; second preference shares, payment of 12s. per share on account of dividends accrued to June 30th, 1908, £2,801; balance to current half-year's account, £1,132. The traffic receipts for the six months show a decrease of £2,253 as compared with those for the corresponding period of 1907. Owing to the difficulty of maintaining uninterrupted cable communication between Demerara and Trinidad, due to the unfavourable nature of the sea bed, the directors, with the consent of the Secretary of State for the Colonies and of the Governments of British Guiana and Trinidad, have decided to establish wireless telegraphy as an additional means of communication. A contract has accordingly been entered into with the Lodge-Muirhead Wireless Syndicate to install the necessary apparatus in Demerara and Trinidad.

Prospectus.—*The Rees Roturbo Manufacturing Co., Ltd.*—The list was to close yesterday (Thursday) in an issue of 85,000 preference shares of £1 each at par, in this company. The nominal capital is £250,000 all in £1 shares, one-half being ordinary and the other half 5 per cent. cumulative preference shares with participating rights *pari passu* with the ordinary after the latter had received 5 per cent. Out of the 40,000 preference shares that are not offered, 13,800 (credited as fully paid) are to be allotted to the debenture-holders of Thomas Parker, Ltd., in exchange for an equal amount of debentures of that company; 90,000 fully-paid ordinary shares are to be allotted as part payment of the price of the property, plant and business, and 12,000 fully-paid ordinary shares are to be allotted as a commission for underwriting 60,000 shares of the present issue.

The company takes over the engineering works and business of Thomas Parker, Ltd., Wolverhampton, and will extend same, manufacturing all classes of centrifugal pumping machinery under the Rees Roturbo patents, dynamos, motors, &c.

Under the agreement with the liquidator of Thomas Parker, Ltd., the latter, as vendors, take as purchase price the payment of the liabilities of the firm as at June 30th last (£78,000), and £90,000 already referred to in ordinary shares. The value of the property as standing in the books at June 30th last, was £126,234 (including £17,479 shares in the Rees Roturbo Development Syndicate) plus £34,838 stock in hand and work in progress, and £9,500 placed to a development account, making the total assets £170,572. The prospectus states that the result of the last six months' trading has shown a satisfactory profit due to the sales of Roturbo machinery, and the electrical work in connection therewith. The proceeds of the present issue of £85,000 preference shares are expected to enable the company to turn over sufficient business to yield a net profit of £25,000 after meeting all charges, depreciation, reserve, &c. This is worked out to show a possible 12 per cent. on all preference and ordinary shares issued (£200,800).

We sincerely hope that this very generous estimate will be found possible of fulfilment in actual practice.

We observe that the prospectus puts the value of electrical machinery turned out by Thomas Parker, Ltd., during the last ten years at over £800,000. Advisedly, from some points of view, the prospectus is silent concerning the profit on that turnover that was distributed in the form of dividends. We must confess that we cannot accept in any seriousness an estimate of profit based upon the last six months' trading, for it clearly is arrived at "in view of the rapidly increasing volume of the business," which seems to us to mean that the actual net profits, even for the short period named, are not at the rate of £25,000 per annum.

Mr. E. S. G. Rees is to be engaged as managing director for a period of five years at £1,000 per annum, plus director's fees. Mr. C. T. Mander is chairman of the company.

Cape Electric Tramways, Ltd.

The meeting of this company was held on Wednesday at the London Wall Buildings, Col. Sir C. Euan Smith in the chair.

In proposing the adoption of the report, the Chairman said that the company still continued to be adversely affected from the causes to which he referred at length at the last annual meeting. During the past 12 months Cape Town and the whole of Cape Colony had suffered more acutely even than in the preceding year from the general commercial and financial depression. The hostility of the Sea Point Municipality, and their active prosecution, through the Cape Government Railways, of an unfair competition with their tramway service had also continued in full force, and had affected them most injuriously. The only change in the position, as between themselves and the Sea Point Railway during the past twelve months, had been that in May last they advanced their tariff on the Sea Point tramway line, so as to bring it within the margin of a payable basis, a measure which in the opinion of their general manager, Mr. Giles, had been fully justified, and which, as far as they could judge, would be still further justified in the near future. He understood from the latest advices from Cape Town that the losses on the Sea Point Railway since it was first opened to traffic on December 1st, 1905, amounted to over £25,000, and this loss was being added to heavily every week that the railway was in operation at the rate of approximately £1,100 per month. They could understand that such a position would be absolutely impossible in the case of an ordinary joint-stock undertaking with directors responsible to shareholders; but the ratepayers of Sea Point were enjoying the advantage of the services of a railway which gave them fares at about half cost, and the Government of Cape Colony, being the operators, the loss at present entirely fell on the Cape Colony taxpayer. In spite of so many powerful factors working against them, they were holding their own by maintaining their tramway service at the highest point of efficiency by an accurate adjustment of rolling stock to traffic conditions, and thereby securing the greatest economy compatible with efficiency. They were now operating under payable conditions, although on a restricted scale. They had on their side the very great advantage of a tramway service which was infinitely more adaptable to suburban requirements than any railway could possibly be. This advantage had made itself felt in the past, and would continue to do so in a greater degree in the future. Even the present Government must ere long find it quite impossible to face Parliament and the country with a railway loss of about £13,000 per annum, incurred solely for the benefit of one of the suburbs of Cape Town; and when the Government faced this position on a basis of sound economics they must alter the present absurdly low tariff to a reasonable paying one, which would place their company on more equal terms with the railway. At Port Elizabeth they had a much simpler problem to deal with. Their tramway system in that town, as at Cape Town, was most excellently and efficiently managed. It was extremely popular, both with the municipal authorities and with the public, but there were equal financial distress and failures in business. Reduction in population and enormous decrease in up-country trade not only reduced the community in Port Elizabeth, but had also curtailed the spending power of those who remained; and any revival of general business would at once alter the condition of affairs in that town. The condition of things now existing in South Africa he felt sure was only temporary. The gold industry was now more prosperous than ever. This must re-act favourably on the general conditions of trade throughout the sub-continent, in which improvement their business was sure to participate.

Mr. L. Breitmeyer seconded the motion.

A short discussion followed, in which Mr. W. H. Cobley said that, in his opinion, the only way in which they could hope for better results was by the directors seeing if it was not possible to still further reduce the expenditure. In 1899, when they carried half the number of passengers they carried last year, they earned a sum of £40,000 and paid a fairly reasonable dividend, while now, although they had doubled their passengers, they were working the concern at a loss.

The Chairman, in reply, said that the subject of the expenditure had formed the subject of earnest consideration last year, and the board were of opinion that they could not further economise without impairing efficiency. The directors had had a very anxious time during the past few years, but they absolutely believed that bottom had been touched and that the company had turned the corner.—The report was adopted.

British Columbia Electric Railway Co., Ltd.

The directors' report for the year ended June 30th, 1908, shows that the business of the company shows continued and increasing prosperity in all departments. The year has been one of quiet steady progress for the cities and districts served by the railway. Large numbers of the best class of settlers have arrived in the country, in a great many instances men who, having made money in the central provinces of Canada or in the United States, prefer to live in the more uniform climate of British Columbia. Building has been active in the cities; a number of large and imposing business structures have been erected, and important public improvements have been carried out. During the spring the managing director, Mr. Buntzen, spent two months in British Columbia, carefully investigating conditions and inspecting the company's property, and he entirely confirms the opinion formed by the Hon. M. R. Gifford last autumn, that the increasing business of the company is founded on sound commercial conditions, and may be relied on to continue. The gross receipts show an increase

of $525,218, or 36 per cent., and the net earnings, including income from investments in subsidiaries, and after charging renewals, show an increase of $208,749 or 30 per cent. over those of the preceding year. The following charges have been made against the revenue account of the year, viz.:—Provision for renewals maintenance (from which £11,830 has been deducted for adjustments and expenditure on renewals during the year), £31,162; bonus to employés, £8,351; amount added to capital amortisation fund, £1,940. The net profit for the year, after making the above deductions, amounts to £154,224; add balance brought forward from last year, £3,481. After deducting the following:—Interest on debentures and debenture stock to June 30th, 1908, £33,231; dividends already paid on 5 per cent. cumulative perpetual preference stock for the year ended June 30th, 1908, £15,000; on preferred ordinary stock for the year ended June 30th, 1908, £19,500; and on deferred ordinary stock for six months to December 31st, 1907, £16,000; there remains available for further distribution and reserves, £73,974. Out of this the directors recommend a dividend on the deferred ordinary stock, including the recent issue of 100,000 deferred ordinary shares of £1 each, at the rate of 8 per cent. per annum for the six months to June 30th, 1908, making 8 per cent. for the year, £20,000; transferring to reserve fund (increasing it to £140,000) £49,000, and carrying forward £4,974.

The number of lights in use at June 30th, 1908, was 287,624, an increase of 70,838 over the number in use on June 30th, 1907. The number of passengers carried during the year was 21,328,180, an increase of 5,046,414. During the year £218,021 has been spent in extensions and improvement of the company's property and equipment. The company has been granted valuable rights to conduct a light and power business in perpetuity by the municipalities of South Vancouver, Burnaby, Richmond, Delta, Surrey, Langley, Matsqui, Sumas and Chilliwack, and the perpetual right—which for 99 years is exclusive—to conduct an electric railway business through the latter five municipalities, under conditions which are in every way satisfactory and equitable to all parties concerned. The acquisition of these important privileges to the company in the districts surrounding and immediately adjacent to Vancouver and New Westminster, has been confirmed by the votes of large majorities of the taxpayers. The company has already established a light and power service in South Vancouver, Richmond, Burnaby and Delta, and with the completion of the railway to Chilliwack, will extend this service into the other municipalities. The Westminster and Chilliwack line is the most important railway extension in hand. It will be approximately 63 miles long, and will pass through perhaps the most fertile territory in British Columbia, namely, the rich lands on the south side of the Fraser River, the proper development of which has up to the present been most seriously retarded by lack of transportation. Already some hundreds of families have settled on the lands adjacent to the new line, and land values have very largely appreciated. A considerable number of industrial works, saw mills, &c., are also being built along the line. Another important and much desired extension is being constructed through the eastern suburbs of Victoria towards Foul Bay. The line will pass the Victoria Cemetery, and terminate near one of the most beautiful bays of British Columbia, with a sheltered position, southern aspect, and fine sandy beach. It is expected to draw a large amount of summer traffic, as indicated by the number of residences already being built there in anticipation of the railway.

The traffic arrangements made with the Canadian Pacific Railway in 1905 with reference to their line from Vancouver to Steveston have been extended to their line from New Westminster to Eburne, which line the company having electrified is now commencing to operate. This company has, in connection with the Chilliwack extension of the railway, acquired through one of its subsidiaries the whole of the shares of the Sumas Development Co., Ltd., which is now actively engaged in protecting by dykes about 35,000 acres of land which have heretofore been subject to periodical overflow by the waters of the Fraser River. The major portion of the cost of these works will be borne by the Dyking Commissioners, and when they are completed they will be maintained by the Commissioners at the cost of the owners of the land benefited. On the completion of the works the company will receive from the Government of the Dominion of Canada a bonus of about 11,000 acres of land, through the centre of which the railway will pass, and which should be very valuable. The carrying out of these works will also provide a better line for the company's railway.

The directors were fortunate enough to foresee the financial troubles which occurred throughout the world last November, and the crisis found the company with large cash reserves with which it was enabled to buy large quantities of supplies in advance, both for ordinary use and the above extensions, at very low prices.

The Vancouver power installation continues to work satisfactorily, and has delivered all the power required in the Vancouver and New Westminster districts. A new electrical unit of 10,500 H.P. has been installed, and it came into operation during the year under review. The installation of a further unit of 10,500 H.P. has been commenced, and it will come into operation during 1909. Certain improvements are being undertaken tending to increase the available water-power, which will then be sufficient to meet the company's prospective needs for some years to come. The directors, fully alive to the possible requirements of the future, have from time to time had practically all the known water powers within possible distance examined by eminent engineers, and, acting on their advice that the falls of the Chilliwack River offer the best available power for future extensions of the system, have secured these water rights with the object of developing them as soon as required. A large increase in the amount of power available for Victoria has become a matter of pressing necessity, which is receiving the earnest consideration of the directors, who have had experienced hydro-electric engineers in the field throughout the summer collecting data on which to base construction plans. The large increase in the volume of the company's business has rendered it necessary to extend the freight yards and sheds and also the company's office and terminus in Vancouver. A large block of land in the heart of the wholesale district of Vancouver has been purchased for the first-named purpose, and the new sheds will be in use before the end of the year. Land adjacent to the company's present offices has also been secured, and during the current year new office buildings and terminal station will be commenced. It has also been found necessary to increase the company's capacity for building rolling stock, and large additions to the building yards and shops at New Westminster have been completed. The directors record their appreciation of the services of the company's general manager, the officers and staff in British Columbia, and their satisfaction with the excellent relations which continue to exist between the company and its employés. The share of profits for the past year distributable among the employés amounts to $40,501.

Since the date of the last report £300,000 further capital has been issued to provide funds to meet the rapid development of the company's business in all departments. The directors now propose to increase the authorised capital by £300,000, leaving the balance of unissued capital at the same figure as last year. In accordance with the stockholders' wishes, as expressed at the last two annual meetings, this further capital was allotted direct to them, and has constituted a very considerable bonus. The directors will, whenever possible, continue to offer all underwriting and issues of new capital direct to the stockholders; but in consequence of representations made, which seem well founded, that this course inflicts an injustice on a large number of firms of stockbrokers who have supported the company by their influence in the past, the directors feel that in future they must stipulate that allotments and underwriting on new shares must be taken up by the stockholders through a stockbroker, to whom the usual commission will be paid by the company.

The period of Mr. Buntzen's engagement as managing director has expired, and, he having decided to reside permanently in Denmark, is unable to continue in his responsible position. His colleagues are glad to inform the stockholders, however, that they have succeeded in persuading Mr. Buntzen to retain his seat on the board and to maintain his close supervision and guidance of the board's general policy in a consulting or advisory capacity. Mr. Buntzen's advice, based on his long experience as general manager, to which much of the company's prosperity is due, is invaluable to his colleagues.

COMPARATIVE STATEMENT.

Year ended June 30th.	Gross earnings.	Net revenue, incldg. income from invest. in subsidiaries.	Passengers.	Lamps in use.	Balance available for dividend.	Pref. ord. stock, rate of dividend paid per ann.	Def. ord. stock, rate of dividend paid per ann.	Amount added to reserves.
	£	£			£			£
1904	165,473	58,762	8,869,486	112,911	37,110	5 %	6 %	14,421
1905	166,964	69,811	10,352,451	136,512	44,291	5 %	6 %	14,144
1906	236,118	98,097	12,295,582	167,330	64,815	5 %	6 %	47,104
1907	299,108	140,899	16,281,766	216,786	81,228	5½ %	7½ %	44,680
1908	408,105	180,481	21,328,180	287,624	120,993	6 %	8 %	73,274

Germany.—Die Electrische Licht und Kraftanlagen Gesellschaft, of Berlin, reports a net profit of £84,854 for the last financial year, as compared with £85,080 in the preceding 12 months. A dividend of 7 per cent. is being declared.

Switzerland.—La Compagnie de l'Industrie Electrique et Mecanique, of Geneva, is being reorganised. It is proposed to write down the present capital of £80,000 to £7,000, and to then increase it to £87,000 by the issue of £80,000 in 6 per cent. preference shares.

Stock Exchange Notices.—The Committee has appointed a Special Settling Day as under:—

Thursday, November 12th.—Singapore Electric Tramways, Ltd.—400,000 shares of £1 each, fully paid, Nos. 1 to 400,000, and £350,000 5 per cent. debentures of £100 each, Nos. 1 to 3,500.

And ordered the undermentioned securities to be quoted in the Official List:—

Kensington and Knightsbridge Electric Lighting Co., Ltd., and the Notting Hill Electric Lighting Co., Ltd.—Further issue of £19,210 4 per cent. debenture stock.

Kaministiquia Power Co., Ltd.—$1,225,000 30-year 5 per cent. gold bonds, Nos. 1 to 895 of $1,000 and A 1 to A 1,000 of $500 each, in lieu of the scrip now quoted.

Shawinigan Water and Power Co.—Further issue of £154,109 4½ per cent. perpetual consolidated mortgage debenture stock.

Bruce Peebles & Co., Ltd.—In the Court of Session at Edinburgh on Tuesday, Lord Skerrington formally approved of the scheme for the reconstruction of this company. The *Financial Times* states that a number of shareholders wrote to the joint liquidators of the company requiring them either to refrain f om carrying through the scheme or to purchase the shareholders' interests under Sec. 161 of the Companies' Act, 1862, and some of these also lodged answers asking the Court to refuse to sanction the scheme unless the liquidators undertook to pay these respondents the value of their interest in the old company.

MARKET QUOTATIONS.

Wednesday, November 11th.

			Latest Price.	Fortnight's Inc. or Dec.
CHEMICALS, &c.				
a	Acid, Hydrochloric	per cwt.	5/-	..
a	,, Nitric	per cwt.	22/-	..
a	,, Oxalic	per cwt.	28/-	..
a	,, Sulphuric	per cwt.	5/6	..
a	Ammoniac, Sal	per cwt.	42/-	..
a	Ammonia, Muriate (crystal)	per ton	£33 10	..
a	,,	per ton	£30	..
a	Bleaching powder	per ton	£5 10	..
a	Bisulphide of Carbon	per ton	£18	..
a	Borax	per ton	£16	..
a	Copper Sulphate	per ton	£21	..
a	Lead, Nitrate	per ton	£25	..
a	,, White Sugar	per ton	£23 10	..
a	,, Peroxide	per ton	£33	..
a	Methylated Spirit	per gal.	2/6	..
a	Potassium Bichromate, in casks	per lb.	5½d.	..
a	Potash, Caustic (75/80 %)	per ton	£30	..
a	,, Chlorate	per lb.	9½d.	..
a	,, Perchlorate	per lb.	9d.	..
a	Potassium Cyanide	per lb.	7d.	..
a	Shellac	per cwt.	100/-	..
a	Sulphate of Magnesia	per ton	£4 10	..
a	Sulphur, Sublimed Flowers	per ton	£6 10	..
a	,, Recovered	per ton	£5 10	..
a	,, Lump	per ton	£5	..
a	Soda, Caustic (white 70 %)	per ton	£10 15	..
a	,, Chlorate	per lb.	2½d.	..
a	,, Crystals	per ton	£3 5	..
a	Sodium Bichromate, casks	per lb.	3d.	..
a	,, Cyanide (basis 100 %)	per lb.	7d.	..
METALS, &c.				
b	Aluminium Ingots, in ton lots	per ton	£70	£10 dec.
b	,, Wire, in ton lots	per ton	£112	£18 dec.
b	,, Sheet, in ton lots	per ton	£120	£8 dec.
b	Babbitt's metal ingots	per ton	£50 to £140	inc.
c	Brass (rolled metal 2" to 12") basis	per lb.	8d.	¼d. inc.
c	,, Tube (brazed)	per lb.	9d.	¼d. inc.
c	,, ,, (solid drawn)	per lb.	8d.	¼d. inc.
c	,, Wire, basis	per lb.	7d.	¼d. inc.
c	Copper Tubes (brazed)	per lb.	9⅜d.	¼d. inc.
c	,, ,, (solid drawn)	per lb.	9⅜d.	¼d. inc.
g	Copper Bars (best selected)	per ton	£79	£5 inc.
g	Copper Sheet	per ton	£79	£5 inc.
g	,, Rod	per ton	£79	£5 inc.
c	,, (Electrolytic) Bars	per ton	£66 10	£3 inc.
c	,, ,, Sheets	per ton	£3 3	£3 10 inc.
c	,, ,, Rod	per ton	£71	£2 10 inc.
c	,, ,, H.C. Wire	per lb.	8½d.	¼d. inc.
f	Ebonite Rod	per lb.	3/3	..
f	,, Sheet	per lb	3/-	..
m	German Silver Wire	per lb.	1/6	..
h	Gutta-percha, fine	per lb.	5/6 to 6/6	..
h	India-rubber, Para fine	per lb.	5/3	1/- inc.
i	Iron Pig (Cleveland warrants)	per ton	51/-	1/6 inc.
l	,, Wire, galv. No. 8, P.O. qual.	per ton	£14	..
g	Lead, English Ingot	per ton	£14 to £14 5	10/- inc.
m	Manganin Wire No. 28	per lb.	8/-	..
g	Mercury	per bot.	..	..
d	Mica (in original cases) small	per lb.	6d. to 1/-	..
d	,, ,, ,, medium	per lb.	2/6 to 4/-	..
d	,, ,, ,, large	per lb.	4/6 to 8/6	..
p	Phosphor Bronze, plain castings	per lb.	1/0½ to 1/2	½d. inc.
p	,, rolled bars & rods	per lb.	1/2½ to 1/3½	½d. inc.
p	,, ,, strip & sheet	per lb.	1/3 to 1/6	inc.
o	Platinum	per oz.	84/-	..
e	Silicium Bronze Wire	per lb.	9½d.	½d. inc.
r	Steel, Magnet, in bars	per ton	£55	..
g	Tin, Block (English)	per ton	£137 10 to £138 10	£6 inc.
n	,, Wire, Nos. 1 to 16	per lb.	1/10½	1½d. inc.
p	White Anti-friction Metals— "White Ant" brand	per ton	£35 to £60	inc.
k	Zinc, Sh't (Vieille Montagne bnd.)	per ton	£24 15	10/- inc.

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p The Phosphor Bronze Co., Ltd.
r W. F. Dennis & Co.

Castner-Kellner Alkali Co., Ltd.—A final dividend of 1s. 6d. per share is recommended, making, with the interim dividend already paid, 12½ per cent. for the year, as against 12 per cent. paid in 1907.

City Meetings.—The reports of several company meetings held on Wednesday and yesterday are unavoidably held over until our next issue.

Victoria Falls Power Co., Ltd.—The *Financial Times* states that this company has commenced an action against the Rand Mines, Ltd., claiming specific performance of an agreement by the Rand Mines to give the Victoria Falls Power Co. the preferent right of supplying power in bulk at rates equal to those quoted by any competing power producer.

STOCKS AND SHARES.

Tuesday Afternoon.

Apart from foreign politics, the chief cause for Stock Exchange complaining is the lack of business. A very small section of members were rendered abnormally active in consequence of the result of the U.S. Presidential election, but this did little good to the generality of members, though the success of Mr. Taft brought about a sharp rise in the price of Anglo-American Telegraph Deferred stock.

Since the decisive figures of the Republican majority became known, copper has risen appreciably, and shares in nearly all the copper companies have been benefited by reports of trade orders, contingent upon Mr. Taft's election, pouring into the market. American Railroad shares, governed by much the same group as that which works the copper market, have enjoyed a further boomlet, and the advance in the price of the metal is declared to be only on the threshold of what will take place before long. Other vague talk, equally wild, is current respecting the possible course of the metal market.

The reports of the Eastern Telegraph and the Eastern Extension Companies are by no means satisfactory, although they demonstrate, as usual, that both concerns are in an extremely strong financial condition. What looks bad is the diminution in the net profits, a state of affairs for which the quietude of business generally, and the further reaction after the Russo-Japanese war, are no doubt in a large measure responsible. Eastern Extensions fell ¼, but the only alteration in Eastern Telegraph issues is a rise of 1½ in the 4 per cent. Debenture stock, which now stands at 104½, and would appear at that price to be valued at every penny of its worth.

Anglo-American Telegraph "A" stock has already been alluded to as a feature of firmness, the price having risen ⅜, after being still better upon a grand bear-scramble resulting from the Presidential election. Neither of the company's two other securities have moved. Marconi shares are in some request—a condition so unusual that it was marked by a rise of 2s. 6d. in the price, bringing the latter to 10s. again. Business was done at half a guinea on Monday in this week. Mackay Common has added to its previous sharp advance to the extent of 1½ at 77½. Globes did not move.

Telephone issues are steady. American Telegraph and Telephone capital stock gained 2 points at 133, participating in the rise that fell to most things of a trans-Atlantic flavour. The 4 per cent. bonds at 95 are another point better, and Oriental Telephone Fours added ½ to their price, which now stands at 102.

In the Home Railway market, the situation is such that it takes but a breath of rumour to exalt or depress prices quite unduly. Conflicting influences are at work, business is quiet, and therefore the fluctuations move sharply. Metropolitan Consols gave way 1½, the Surplus Lands stock fell 1, and Districts were also lowered a point. On the other hand, the Tube stocks have not changed, and the prior charge issues maintain considerable firmness. Charing Cross, Euston and Hampstead 4 per cent. Debenture can hardly be bought below 87, and the investor on the lookout for a lock-up stock is interesting himself in this. The Underground Electric Railways trio holds to its previous prices.

British Columbia Electric Railway Deferred stock rose a point upon the excellent dividend announcement and statement, and other descriptions of like nature are all firm. London United Tramways Debenture stock improved, but eased off again. British Electric Traction First Debenture regained its slight fall of last week. More noticeable still is a faint rally in British Westinghouse Preference shares, which, at 10s., show a rise of 1s. 3d.; it must be many months since the quotation has moved upwards. The 6 per cent. Prior Lien Debenture scrip stand at 97. It may be parenthetically observed that even the stocks and shares of the London and General Omnibus and Road Car Companies are very gradually mending. Calcutta Trams have fallen because of the unrest in India.

In authoritative circles it is declared that friendly *pourparlers* are again afoot between the Mexican Light and Power and the Mexico Tramways. A meeting of large shareholders, convened in a semi-private manner, we believe to have been held at the end of last week. One conclusion arrived at was that nothing should be publicly announced until negotiations had come to some definite arrangement in regard to the still proposed scheme of working agreement or amalgamation. Colour was lent to this statement by sharp rallies in the prices of both companies' common stocks, but the full measure of improvement was not maintained. The price of the Power undertaking stock is 1½ up at 75, while Mexico Tramways at 139½ shows a rise of 4 points. Yet the 5 per cent. bonds of the Mexican Electric Light Company are 2 lower.

Rio de Janeiro Tramway, Light and Power Common shares continue their remarkable rise, and at 75½ are 4½ better, making an advance of 6½ in less than a fortnight. The 5 per cent. Gold Bonds at 91½ show a rise of the fraction.

Electricity Supply issues are neither much better nor much worse. The Kensington Companies' shares are ¼ down, and City of London Ordinary is ¼ easier. Charing Cross, City undertaking Preference are ⅛ to the good, and St. James's and Pall Mall Preference are the same fraction higher. The progress of the London and District Bill in Parliament is being watched with great interest, academically, but as a financial market factor, it has so far exerted practically no effect upon prices.

The diminutive increase in the dividend on Castner-Kellner Ordinary shares led to a little disappointment, expectation having looked for something better. At 32s. the price of the shares is steady. British Aluminium have not rallied. A rise of 1 brought British Insulated 4½ per cent. Debenture stock to 105½. Rubber shares have strengthened upon the rapid rise in the price of the material, but the recovery in the former has, so far, been in no way commensurate with the jump in the latter.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1904.	1905.	1906.	1907.	Closing Quotations Nov. 3rd.	Closing Quotations Nov. 10th.	Business done week ended Nov. 10th, 1908. Highest	Lowest.	Rise + or Fall −	Present Yield per cent.
												£ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	2⅛ — 3⅛	2⅛ — 3⅛	..	..	..	Nil.
136,700	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	Nil	5 %	5 %	5 %	90 — 93	90 — 93	..	..	..	5 7 6
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7¾%	7¾%	8 %	8 %	129 —133	131 —135	..	..	+2	5 18 6
$58,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	93 — 95	94 — 96	..	..	+1	4 3 4
598,180	Anglo-American Telegraph	Stock	2⅞%	3⅛%	3⅞%	3⅛%	57 — 60	57 — 60	57⅞	57	..	5 16 8
3,200,910	Do. do. do. 6 % Pref.	Stock	5⅝%	6 %	6 %	6 %	102 —103	102 —103	103	102⅝	..	5 16 6
3,200,910	Do. do. do. Deferred	Stock	Nil	½	1⅜%	1 %	16½ — 17	17⅛ — 17⅜	17⅜	16½	+ ⅜	5 12 8
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	..	5 %	5 %	5 %	99 —102	99 —102	..	..	..	4 16 2
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	8 %	8 — 8½	8 — 8½	..	..	..	4 14 1
2,382,376	Commercial Cable Stng. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	88½ — 89⅜	88½ — 90½	..	..	+ ½	4 8 5
16,000	Cuba Telegraph	10	5 %	5 %	5 %	6 %	7⅜ — 8½ xd	7⅜ — 8⅜	8	..	..	7 1 2
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	16½ — 17½ xd	16½ — 17½	..	..	..	5 15 11
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	3 — 3½	3 — 3½	..	..	..	5 14 3
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8 — 9	8 — 9	8⅛	..	..	5 8 1
30,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	8 14 10
60,710£	Direct United States Cable	20	3½%	4½%	4½%	4½%	13½—13⅝	13½— 13⅝	13⅝	13½	..	6 2 6
50,900£	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,900, R.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 3
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	7 %	135 —138	135 —138	137	135	..	5 1 5
2,000,000	Do. 3½ % Pref. Stock	100	3½%	3½%	3½%	3½%	84 — 86	84 — 86	85½	84½	..	4 1 5
1,886,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	102 —104 xd	103½—105½	105	103⅝	+1½	3 17 8
800,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	7 %	12½ — 13	12½ — 13⅛	12⅝	12⅜	— ¼	5 9 10
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	101 —103	101 —103	102⅛	101⅛	..	3 17 8
269,700	East & S. Afric. Tel., 4 % Mt. Db., 1 to 8,000, red. 1909	100	4 %	4 %	4 %	4 %	99½—101⅛	99½—101⅛	..	..	..	3 18 10
200,000£	Do. 4 % Reg. M. Debs. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	92⅛—101⅜ xd	99½—101⅛	..	..	..	3 18 10
181,127	Globe Telegraph and Trust	10	5⅝%	5½%	5½%	5½%	10½ — 11	10½ — 11	10⅝	10⅜	..	5 9 6
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	6 %	13⅜ — 13⅞	13⅜ — 13⅞	13⅛	13⅛	..	4 6 6
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	24 %	24%	20 %	20 %	30 — 32	30 — 32	31½	30⅝	..	6 5 0
19,600£	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 3
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	13 %	56 — 59 xd	56 — 59	57½	..	..	5 2 7
$41,380,400	Mackay Companies Common	$100	1 %	2 %	3⅜%	4 %	74 — 78	70 — 75	..	..	..	5 8 1
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	70 — 74	68 — 72	..	..	..	5 9 7
894,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	Nil	7/16— 7/8	7/16— 7/8	10/6	..	+ ⅛	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	4 %	5 %	6 %	6 %	31/32— 1 1/32	31/32— 1 1/32	21/-	20/-	..	5 9 1
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	1 — 1	1 — 1	19/6	18/1½	..	5 0 0
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	109 —111	109 —111	109½	109	..	5 8 1
3,725,000	Do. do. Def. Stock	100	5 %	5 %	5 %	6 %	117 —119	117 —119	118½	117⅜	..	5 0 10
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½ — 11½	10½ — 11½	..	..	..	5 6 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10½ — 11½	10½ — 11½	..	..	..	4 8 11
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5/16— 6/16	5/16— 6/16	5/16	..	..	4 7 1
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	98 —100	98 —100	..	..	..	3 10 4
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	102 —104	102 —104	103½	..	..	3 16 11
179,313	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	6¾%	7 %	7 %	8 %	1⅜ — 1⅝	1⅜ — 1⅝	..	..	..	5 16 4
50,000	Do. do. 6 % Cum. Pref...	1	6 %	6 %	6 %	6 %	1⅜ — 1½	1⅜ — 1½	..	..	..	4 16 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	..	4 %	4 %	4 %	90 — 93	90 — 93	..	..	..	4 6 0
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100 —103	100½—103½	..	..	+ ½	3 17 4
11,839£	Reuter's	8	5 %	5 %	5 %	5 %	7 — 8	7 — 8	..	..	..	5 0 0
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	..	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
3,088	Submarine Cables Trust	Certs.	6 %	6 %	6 %	6 %	127 —130	127 —130	127½	..	..	4 12 4
100,000	United River Plate Telephone	5	8 %	8 %	8 %	8 %	6⅞ — 7⅛	6⅞ — 6⅞	6⅞	..	..	5 16 4
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
30,008	W. Coast of America, 1 to 30,000 & 58,001 to 58,008	2½	Nil	Nil	2½%	2½%	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	4 3 4
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	100 —103	100 —103	..	..	..	3 17 8
207,930	Western Telegraph, Ltd., Nos. 1 to 207,930.. ..	10	7 %	7 %	7 %	7 %	13½ — 14	13⅝ — 14	14	13⅛	..	5 0 0
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	102 —104	102 —104	103⅜	..	..	3 16 11
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	2/16— 3/16	1/16— 2/16	11/8	..	..	Ni
34,568	Do. do. 6 % Cum. 1st Pref.	10	6 %	5 %	6 %	6 %	8 — 8½	8 — 8½	..	..	..	7 1 2
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	Nil	£2 6	8½ — 9½	8½ — 9½	..	..	..	2 9 0
80,000£	Do. do. 5 % Debs., Nos. 1 to 1,600 ..	100	5 %	5 %	5 %	5 %	101 —103	101 —103	..	..	..	4 17 1

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

330,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,097	5	8 %	8 %	8 %	9 %	8/16— 8⅛	8⅜ — 8⅞	8⅞	8⅛	+ 1/16	5 1 5
260,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5⅛%	5⅛%	5⅛%	5⅜%	6/16— 6/16	6/16— 6/16	6½	6⅛	..	4 10 3
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	141 —146	141 —146	..	..	..	4 2 2
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	102 —105	102 —105	..	..	..	4 15 3
880,000	Babcock & Wilcox, 1 to 880,000	1	20 %	20 %	20 %	20 %	3⅛— 3⅜	3⅛— 4	77/-	76/-	— 1/16	5 1 6
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1⅛— 1⅜	1⅞— 1⅛	..	..	..	3 13 10
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	7 %	1⅝— 2⅛	1⅝— 2⅛	..	..	..	15 1 2
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	3 — 4	3 — 4	..	..	..	8 15 0
40,000	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	4 — 4½	4 — 4½	..	..	..	6 13 4
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3⅞— 4¼	3⅞— 4¼	..	..	..	4 12 7
43,478	Do. do. 5 % 1st Mort. Deb. Stock Red.	Stock	5 %	5 %	5 %	5 %	104 —108	104 —108	..	..	..	4 10 11
300,000	Do. do. 5½ % Loch Leven Debs. ..	100	..	..	5½%	5½%	97 —100	97 —100	..	..	..	5 14 4
400,000	British Columbia E. Rail Def. Ord. Stock	100	6 %	6 %	6 %	8 %	135 —139	136 —140	139	138½	+1	5 15 1
400,000	Do. 5 % Pref. Ord. Stock	100	5 %	5 %	5 %	5 %	115 —119	115 —119	118	116	..	4 4 0
800,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	106 —110	106 —110	109	107½	..	4 10 11
223,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	101 —103	101 —103	..	..	..	10 17 6
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	103 —106	103 —106	..	..	..	4 4 11
188,301	British Electric Traction	10	6 %	3 %	Nil	Nil	⅞ — 1⅛	⅞ — 1⅛	21/8	20/-	..	Nil
161,487	Do. do. 6 % Cum. Pref.	10	6 %	6 %	6 %	3 %	3½ — 4	3½ — 4	76/8	72/6	..	7 10 0
1,473,653	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	89 — 94	90 — 95	90¾	..	..	5 6 3
528,936	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	73 — 75 xd	76 — 78	..	..	..	6 0 0
100,000	British Insulated and Helsby Cables	5	8 %	8 %	10 %	10 %	6½ — 6⅝	6½ — 6⅝	..	..	..	7 8 2
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6 — 6⅛	6 — 6⅛	..	..	..	4 12 4
500,000	Do. do. 4½ % 1st Mort. Deb. Red. ..	100	4½%	4½%	4½%	4½%	103 —106	104 —107	106½	..	+1	4 4 1
208,440	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	91 — 96	91 — 96	..	..	..	4 13 9
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	Nil	5/16— 7/16	3/8 — 5/8	..	..	+ 1/16	Nil
1,016,858	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	40 — 45	40 — 45	..	..	..	8 17 10
50,000	‡Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	Nil	9/16— 11/16	9/16— 11/16	..	..	..	Nil
50,000	‡ Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	Nil	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
105,781	Brush Electrical Engineering, Ord., 1 to 105,781 ..	2	Nil	2½%	Nil	Nil	..	..	..	..	..	Nil
150,000	Do. do. Non-cum. 6 % Pref.	2	6 %	6 %	Nil	Nil	..	..	..	..	..	Nil
125,000£	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	68 — 73	68 — 73	..	..	..	6 8 3
125,000£	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	50 — 54	50 — 54	..	..	..	8 6 0
187,510	Calcutta Trams, 1 to 187,510	5	8 %	8 %	8 %	6 %	4⅜ — 5⅜	4⅛ — 5	..	..	— ⅛	6 0 0
45,304	Do. 5 % Cum. Pref., Nos. 1 to 29,880.. ..	5	..	5 %	5 %	5 %	4⅜ — 5⅛	4⅛ — 5⅛	5	..	— ⅛	4 17 7
850,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	103 —106	103 —106	..	..	..	4 4 11
85,000	Callender's Cable Construction shares	5	12½%	15 %	15 %	15 %	9½ — 10½ xd	9½ — 10½	9⅜	..	..	7 2 10
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	5½ — 5⅝	5½ — 5⅝	5⅝	5⅝	..	5 6 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	107½—109½	107½—109½	109½	..	..	4 2 2
491,322	Cape E Trams., 1 to 491,322	1	5 %	Nil	Nil	Nil	1/16— 2/16	1/16— 2/16	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	4 %	6 %	8 %	12 %	1⅛ — 1⅛	1⅛ — 1⅛	32/-	31/9	..	7 14 10
210,153	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	4½%	103 —107	103 —107	105½	..	..	4 4 1
1,898,610	Central London Railway, Ord. Stock..	Stock	4 %	4 %	4 %	3 %	68 — 70	68 — 70	68½	68	..	4 5 9
553,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	86 — 88	86 — 88	86	..	..	4 10 11
553,195	Do. do. Def. do.	Stock	4 %	4 %	4 %	2 %	50 — 53	50 — 53	52	51	..	3 15 6
1,480,000	City and South London Railway	Stock	2⅛%	1⅞%	2⅛%	2⅛%	32½— 33½	32½— 33½	33½	32½	..	6 6 10

* Unless otherwise stated, all shares are fully paid. † A period of nine months. ‡ From Manchester Share List.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years.				Closing Quotations Nov. 3rd.	Closing Quotations Nov. 10th.	Business done week ended Nov. 10th, 1908.		Rise + or Fall —	Present Yield per cent.
		*	1904.	1905.	1906.	1907.			Highest	Lowest.		£ s. d.
85,000	Crompton & Co., Nos. 1 to 85,000	S	2¼%	2¼%	5 %	5 %	1 5/16 — 1 9/16	1 5/16 — 1 9/16	..	..	..	9 10 6
100,000	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	98 —101	98 —101	..	..	..	4 19 0
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1 1/16 — 1 5/16	1 1/16 — 1 5/16	24/4½	23/1½	..	7 12 5
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 — 1 1/16	1 — 1 1/16	22/3	..	..	4 16 0
276,880	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6%	6 %	6½%	11½ — 12½	11½ — 12½	..	..	..	5 4 0
60,000	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12½ — 13½	12½ — 13½	..	..	..	4 8 11
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	5	2½%	4½%	4½%	4½%	9/16 — 13/16	9/16 — 13/16	..	..	..	15 7 6
17,189	Do. "A" shares, 01—017,189	5	2½%	4½%	4½%	4½%	2 — 2½	2 — 2½	..	..	..	8 6 9
317,875	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	76 — 79	76 — 79	..	..	..	5 1 3
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	5 %	24 — 27	24 — 27	..	..	..	5 14 11
112,100	Electric Construction, 1 to 112,100	2	4 %	Nil	Nil	Nil	7/16 — 1/2	7/16 — 1/2	..	..	..	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390..	2	7 %	7 %	7 %	7 %	1 1/16 — 1 3/16	1 1/16 — 1 3/16	..	..	..	8 0 0
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	5 %	7 — 7 1/16	7 — 7 1/16	..	..	..	16 13 4
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	84 — 88	84 — 88	..	..	..	4 10 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	4 %	4 %	¾ — 1	¾ — 1	..	..	..	5 0 0
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	7 %	10½ — 10¾	10½ — 10¾	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103½	102 —103	..	..	..	4 17 1
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15 %	15%	15 %	15%	10½ — 11½	10½ — 11½	..	..	..	7 8 2
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 5½	5 — 5½	..	..	..	4 1 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	107 —109	107 — 109	..	..	..	4 2 7
50,000	India-Rubber, Gutta-percha & Telegraph Works..	10	5 %	10%	10 %	10 %	16½ — 17½	16½ — 17½	16 15/16	..	..	5 14 3
87,500	†Liverpool Overhead Railway, Ord.	10	1½%	Nil	Nil	½%	1½ — 1¾	1½ — 1¾	..	..	..	4 0 0
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	5 — 5½	5 — 5½	..	..	..	9 1 10
600,070	London United Trams. (1901), 1 to 50,007	10	6 %	8 %	8 %	8 %	6¾ — 6¾	6¾ — 6¾	..	..	..	4 8 11
399,330	Do. do. 50,008 to 100,000	10	6 %	8 %	8 %	8 %	6¾ — 6¾	6¾ — 6¾	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	5 %	4½ — 5½	4½ — 5½	95/-	90/-	..	9 1 10
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	70 — 75	70 — 75	70½	70	..	5 6 8
5,782,062	Metropolitan Consolidated	100	3 %	2½%	1 %	½%	33½ — 39½	37 — 38	38⅜	36	— ⅛	1 6 4
2,640,914	Do. Surplus Lands	100	2½%	2½%	2½%	2½%	68 — 70	67 — 69	68	67⅞	—1	3 19 9
3,285,000	Do. District	100	Nil	Nil	Nil	Nil	13½ — 14½	12½ — 13½	13½	12½	—1	Nil
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	Nil	3/32 — 5/32	3/32 — 5/32	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	2/8 — 3/8	2/8 — 3/8	..	..	..	5 19 5
823,800	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	92 — 95	92 — 95	94⅜	94	..	4 14 9
245,500	Potteries E. Trc.	1	5 %	4 %	4 %	4 %	⅛ — ¼	⅛ — ¼	..	..	..	8 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	2/32 — 3/32	2/32 — 3/32	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	92 — 95	92 — 95	92½	92	..	4 14 9
87,350	Telegraph Construction and Maintenance	12	15 %	15 %	15 %	17½%	32 — 34	32 — 34	33½	..	..	6 18 8
150,000	Do. 4 % Deb. Bds., 1 to 1.500 Red., 1909	100	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..	3 17 8
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	..	..	91½ — 92½ xd	91½ — 92½	91⅜	91½	..	..
2,800,000	Do. do. 4½% Bonds	..	..	..	..	..	75½ — 76½	76½ — 76½	76½	..	..	..
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	23 — 24	23 — 24	23½	23	..	..
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	Nil	Nil	10 %	½ — 1	½ — 1	16/3	..	..	10 0 0
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	Nil	Nil	..	6 %	2⅜ — 2⅞	2⅜ — 2⅞	51/3	..	..	10 8 8
246,404	Do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	72 — 76	72 — 76	72	..	..	5 5 3

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	5	5½%	5½%	5½%	6%	4⅜ — 4⅝	4⅜ — 4⅝	..	..	..	5 11 5
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	94 — 98 xd	94 — 98 xd	..	..	..	4 10 0
30,275	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10 %	10%	10 %	7 — 8	6⅞ — 7⅞	7 1/16	..	— ¼	6 9 0
9,725	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	7 — 8	6⅞ — 7⅞	..	..	— ¼	4 15 4
336,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	99 —102	99 — 102	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	8 %	5 %	5 %	5 %	3⅞ — 4	3⅞ — 4	..	..	..	6 5 0
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	3¾ — 4¼	3¾ — 4¼	81/3	..	..	5 5 11
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3½ — 3⅝	3⅝ — 3⅝	..	..	+ ⅛	5 16 2
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	96 — 99	96 — 99	..	..	..	4 10 11
49,486	Chelsea Electricity Supply, Ord.	5	6 %	6 %	4½%	4½%	2⅝ — 3⅜	2⅝ — 3⅜	60/-	..	..	6 13 4
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	9½ — 10	9 — 9⅞	9 15/32	..	— 1/32	6 3 1
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12 — 13	12 — 13	12⅜	12½	..	4 12 4
400,000	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	122 —125	122 —125	..	..	..	4 0 0
300,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
50,000	County of Durham Electrical Power, Ord.	5	£3 7 0	4 %	4 %	2 %	2½ — 3	2⅜ — 3	..	..	..	3 6 8
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	3½ — 4	3½ — 4	..	..	..	6 5 0
200,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	..	..	99 —101	99 —101	..	..	..	..
40,000	County of London Electric Lighting, Ord. 1—40,000	10	4½%	5 %	5 %	5 %	7 — 8	7 — 8	7⅜	..	..	6 5 0
50,026	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10½ — 10⅞	10½ — 10⅞	10 1/16	..	..	5 11 8
400,000	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	107 —110	107 —110	..	..	..	4 1 10
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	99 —100 xd	97 —100	..	..	—1	4 10 0
80,000	Edmundson's Electric Corporation, Ord. Shares	5	7 %	4 %	Nil	Nil	⅛ — ¼	⅛ — ¼	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	3 %	Nil	¾ — 1	¾ — 1	..	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	59 — 66	59 — 66	..	..	..	6 16 4
$8,150,000	Electrical Dev. Co. of Ontario, 5% 1st Mtg. Gold Bnds.	$500	..	..	..	..	81 — 84	82 — 85	84⅛	83¼	+1	..
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4⅜ — 5⅛	4⅜ — 5⅛	..	..	..	5 4 9
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	..	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	97 — 100	97 —100	..	..	..	4 10 11
15,000	Hove, 1 to 15,000	5	8½%	9 %	9 %	8½%	6 — 6½	6 — 6¼	..	..	..	6 10 9
$1,325,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	..	94 — 96	94 — 96	95½	..	..	..
21,000	Kensington and Knightsbridge Electric Ord.	5	12 %	10 %	10 %	10 %	7⅞ — 8⅛	7⅞ — 8⅛	..	..	— ⅛	5 17 8
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	94 — 97	94 — 97	..	..	..	4 2 6
111,000	London Electric Supply Corporation, Limited, Ord.	3	3 %	4 %	4 %	2½%	⅞ — 1⅛	⅞ — 1⅛	..	..	..	5 8 1
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	4⅜ — 4⅝	4⅜ — 4⅝	..	..	..	6 9 9
374,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4 %	4½%	4½%	89 — 92	89 — 92	..	..	..	4 17 10
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	10 %	8 %	6½%	4⅛ — 4⅜	4⅛ — 4⅜	93/9	92/6	..	6 16 10
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4⅜ — 4⅝	4⅜ — 4⅝	..	..	..	4 12 4
220,000	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	105 —109	105 —109	..	..	..	4 2 7
248,000	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½%	3½%	3½%	3½%	84 — 89	84 — 89	84½	..	..	3 18 8
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	..	5 %	5 %	5 %	5 %	86 — 88	84 — 86	8⅝	85	—2	5 16 3
$13,585,000	Do. Light and Power Co., Ltd., Common	$100	..	..	..	..	72 — 74	74 — 76	76	71½	..	..
$1,500,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	..	104 — 106 xd	103½ — 105½	104⅜	103½	— ⅛	..
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	..	..	..	..	..	88 — 90	88 — 90	89	88½	..	..
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	96 — 98	95 — 98	..	..	..	4 11 10
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	8 %	4⅞ — 5⅛	4⅞ — 5⅛	..	..	..	7 8 10
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	5 %	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
10,852	Notting Hill Electric Lighting	10	7 %	7½%	7½%	7½%	11⅜ — 12⅜	11⅜ — 12⅜	..	..	..	5 17 8
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	7 %	5⅞ — 6⅛	5⅞ — 6⅛	..	..	..	5 12 0
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	95 — 98	95 — 99	..	..	..	4 1 8
119,694	River Plate Elcty. Co. Ord. Nos. 1 to 120,507	1	..	..	2½%	..	1 5/16 — 1 9/32	1 5/16 — 1 9/32	25/-	23/6	+ 3/32	..
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6	6	6	6	1 5/16 — 1 7/16	1 5/16 — 1 7/16	..	..	..	..
194,684	Do. do. 5% Deb. Stk. Red.	100	5	5	5	..	99 — 102	99 —102	100½	100	..	4 18 0
40,000	St. James' and Pall Mall Electric Light, Ord.	5	14½%	12½%	10 %	10 %	7⅞ — 8⅛	7⅞ — 8⅛	7⅞	..	..	6 1 3
20,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %	6⅞ — 7⅛	7 — 7⅛	7⅛	7 3/32	+ ⅛	4 13 4
150,000	Do. do. 3½ % Deb. Stock Red.	100	3½%	3 %	3½%	3½%	86 — 90	86 — 90	..	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	4 %	Nil	Nil	⅛ — ¼	⅛ — ¼	..	..	..	Nil
46,700	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	68 — 72	68 — 72	..	..	..	5 11 1
65,000	South London Electricity Supply, Ord.	5	4 %	4 %	3 %	4 %	2⅛ — 2⅜	2⅛ — 2⅜	..	..	..	7 5 5
120,000	South Met. Elec. Lt. & Power, Ord.	1	Nil	2½%	2½%	2½%	⅜ — ½	⅜ — ½	..	..	..	4 0 0
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1 1/16 — 1 1/8	1 1/16 — 1 1/8	20/7½	..	..	6 4 5
200,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	99 —101	99 —102	..	..	..	4 8 3
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	¾ — 1	¾ — 1	..	..	..	20 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	1½ — 2¼	1½ — 2¼	..	..	..	11 2 2
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	80 — 83	80 — 88	82	..	..	5 8 5
800,000	Victoria Falls Power Co., Pref. Nos. 1 to 800,000	1	..	..	..	..	⅜ — ½	⅜ — ½	..	..	..	..
110,000	Westminster Electric Supply, Ord.	5	14 %	12 %	12 %	10 %	7⅞ — 8⅛	7⅞ — 8⅛	7 29/32	..	..	5 17 8
81,279	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	5 %	5 %	4½%	4½%	5 — 5⅛	5 — 5⅛	5⅛	..	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. § Interim Dividend.

Bank rate of Discount 2½ per cent., May 28th, 1908.

TRADE STATISTICS OF NEW ZEALAND.

The following figures show the imports of electrical and other material into New Zealand during the year 1907, and are taken from the recently issued trade statistics for that colony; the figures for 1906 are given for purposes of comparison, and notes of any increases or decreases are added:—

	1906.	1907.	Increase or decrease.
Scientific Instruments (except medical, dental, surveying, &c.).—	£	£	£
From Great Britain ...	4,900	6,000	+ 1,100
„ Victoria	100	600	+ 500
„ New South Wales	300	400	+ 100
„ Germany ...	1,900	400	— 1,500
„ United States ...	300	300	—
„ Other countries ...	400	100	— 300
Total	7,900	7,800	— 100
Rails.—			
From Great Britain ...	197,000	122,200	— 74,800
„ Victoria	200	900	+ 700
„ New South Wales...	600	900	+ 300
„ Germany	700	100	— 600
„ Belgium	900	11,900	+ 11,000
„ United States ...	2,200	300	— 1,900
„ Other countries ...	—	—	
Total	201,600	136,300	— 65,300
Telegraph and Telephone Wire.—			
From Great Britain ...	26,800	600	— 26,200
„ Germany	9,400	—	— 9,400
„ Other countries ...	200	—	— 200
Total	36,400	600	— 35,800
Electrical Machinery.—			
From Great Britain ...	109,000	157,100	+ 48,100
„ Victoria	8,100	11,100	+ 3,000
„ New South Wales...	22,000	19,500	— 2,500
„ Germany	6,900	6,300	— 600
„ Sweden	2,200	5,100	+ 2,900
„ Belgium	17,400	13,200	— 4,200
„ United States ...	21,300	20,800	— 500
„ Other countries ...	600	200	— 400
Total	187,500	233,300	+ 45,800
Steam Engines.—			
From Great Britain ...	6,400	6,500	+ 100
„ United States ...	1,200	2,700	+ 1,500
„ Other countries ...	100	200	+ 100
Total	7,700	9,400	+ 1,700
Gas and Oil Engines (except for motor-cars).—			
From Great Britain ...	45,000	72,700	+ 27,700
„ Victoria	1,900	1,000	— 900
„ New South Wales...	2,600	2,100	— 500
„ France	500	400	— 100
„ United States ...	25,300	30,800	+ 5,500
„ Belgium	1,500	400	— 1,100
„ Other countries ...	1,000	2,700	+ 1,700
Total	77,800	110,100	+ 32,300
Boilers for Engines.—			
From Great Britain ...	4,500	7,100	+ 2,600
„ New South Wales...	—	1,000	+ 1,000
„ United States ...	200	600	+ 400
Total	4,700	8,700	+ 4,000
Mining Machinery.—			
From Great Britain ...	33,900	27,500	— 6,400
„ Victoria	1,800	4,300	+ 2,500
„ New South Wales...	1,200	2,000	+ 800
„ United States ...	3,000	1,400	— 1,600
„ Other countries ...	600	—	— 600
Total	40,500	35,200	— 5,300
Pitch.—			
From Great Britain ...	800	3,600	+ 2,800
„ Other countries ...	100	100	—
Total	900	3,700	+ 2,800
Locomotives.—			
From Great Britain ...	800	900	+ 100
„ New South Wales...	300	—	— 300
„ Germany	500	—	— 500
Total	1,600	900	— 700
Tramway Plant.—			
From Great Britain ...	5,400	1,000	— 4,400
„ United States ...	4,400	2,700	— 1,700
„ Other countries ...	700	100	— 600
Total	10,500	3,800	— 6,700

PROCEEDINGS OF INSTITUTIONS.

Railway Signalling: Its Defects, and Suggestions for Removing Them.

By Captain A. Gardiner, R.E., Associate.

(*Abstract of paper read before the* Institution of Electrical Engineers *at Leeds, October 28th*, 1908.)

The method by which control over the movement of trains is secured by the semaphore, despite all the scientific thought and attention that has been devoted to it, is still unsatisfactory.

The signal has to be seen by the driver of the train, it has then to be correctly interpreted, and then to be promptly complied with.

In each item of this sequence there lies an element of chance that has but too frequently produced appalling disasters, and must continue to do so, so long as we have to rely wholly upon the human element for giving effect to the order that the signal is intended to convey.

The difficulties and dangers are so great that a recognition is undoubtedly growing of the need for some means of bringing the state of the signal emphatically and unmistakably to the notice of the drivers on their cabs, and making the neglect or unobservance of signals necessitate deliberate action on the part of the driver, so as to transform inertness into activity, and ensure that it is no dead man's hand or eye to which the safety of the traveller is entrusted.

Thus, on the Metropolitan District Railway we see a description of actual train control, whereby a train running past a signal at "danger" has its brake applied automatically through the impact of an arm on the track against a lever carried on the train.

On the Great Western Railway, train control is not attempted, but they also disclose the craving for something more efficient than the semaphore in the cab signal which they have substituted for the ordinary "distant" on some sections of that line.

Immediately a really reliable substitute for one of our existing semaphores is discovered, that semaphore *disappears*. The Great Western cab signal is not a signal repeater—it is a signal; and the semaphore being no longer required for the particular indication that their cab signal provides, it has begun to be abandoned as far as that indication is concerned, as it will undoubtedly be abandoned for every other indication once a really efficient substitute is found.

The North-Eastern Railway install a series of signalling points, each of which confirms, or may cancel, the indication previously given; unfortunately the signal has a "gravity" safety position, being operated by a magnet that is "dead" for the safety position, and requires to be excited in order to show danger. The result is that any failure in the signal magnet circuit means a failure to remove the safety indication. The defect is sufficiently grave, it would seem, to limit the scope of this system strictly to repeating the external signals. For the reasons already given this is an undesirable handicap, making the system fall far short of the ideal that railways are seeking for.

Another respect in which our present system of external signals breaks down is as regards reductions of speed. There is no railway signal that denotes "reduce speed" for a dangerous piece of track, and instructions are given either by means of boards, frequently unreadable at night, or by printed standing orders, or by written instructions to the driver. The efficiency of the system is again of the lowest, for safety once more depends wholly upon human obedience.

With signals on the cab, not only is it possible to give a "reduce speed" indication that cannot be confounded with any of the other indications, but it becomes possible also to make that signal act directly on the motive power of the engine, and so enforce compliance; and further, by providing for the automatic removal as well as the automatic exhibition of the signal, it becomes possible to obtain a record from which the actual speed over the restricted section can be indisputably established.

A perfect system of train control by cab signals should, to meet all the requirements of traffic working, fulfil at least the following conditions:—

1. It must comply with the essential principle that any breakdown of the apparatus that can impair its accuracy shall completely remove the "safety" indication and produce either a "danger" or a "disabled" signal.

2. It should be wholly in the cab, and not depend partly upon signals in the cab and partly upon signals on the track.

3. It should signal, not at one point or several points, but at every point, so that a train shall be continuously in receipt of a positive signal.

4. It should simultaneously act directly upon the motive and brake power of the train, so that it shall be automatically obeyed;

and not, having been at great expense automatically given, depend wholly upon human compliance.

5. It should provide an audible as well as visual "danger" signal, as an additional safeguard against momentary inattention on the part of the driver.

6. It should enable an automatic record to be maintained of all signals received and of the exact time of receipt.

7. It should provide that, automatic control having been set up, it shall be practicable for the driver to reassume his control over the motive and brake power of his train without interfering with the efficiency of the apparatus in delivering further signals.

The method proposed involves the eventual entire abolition of the semaphore and its lamp, with the following immediate results:—

1. In place of the usual external signals we obtain primary indications in the cab itself visible, and if desired audible, at all times despite fog or storm.

2. For the operation of a human driver liable to err in picking out which particular lights or arms of each signal group alone refer to his particular train, it becomes possible to substitute automatic selection, and to present the result alone in unmistakable form before the driver in his cab.

3. For verbal evidence, frequently defective, often false, as to signals received during a run, we are enabled to secure an indisputable automatic record of the signals received, it may even be of the action taken in the case of the "danger" indications.

4. For a signal that may mean "stop" and may mean "prepare to stop," and which frequently can but with difficulty be correctly interpreted, it substitutes a "stop" signal that always means "stop," as well as a "danger" signal that always means "danger."

5. For a requirement of traffic working that has not as yet been adequately met, it provides a "reduce speed" signal, disregard of which can be subsequently detected or proved.

6. Finally, we secure indications which can readily be made to act directly on the engine itself, and be automatically obeyed; in place of indications, compliance with which must depend wholly upon the unchecked human element.

The means are as follows:—

Parallel to the running rails is laid a metallic "track conductor" (T.C. fig. 1), probably of tee or angle iron, of section about 1½ in. × 1½ in. × ¼ in., and carried on wooden posts 6 to 10 ft. apart at the maximum distance from the track that the running dimensions admit of. The height of the track conductor above rail level must suffice to ensure that the moving contacts shall clear the top of the rails at crossings, metalling of cart roads, and so on; and to enable engines to run either chimney or tender foremost with a single track conductor they must, if the conductor is placed externally, carry the contact devices in duplicate; so that the conductor is free to be placed for short lengths on whichever side of the line happens to be locally most convenient.

The track is split up into track circuit sections of the desired length (insulated joints I_1 I_2), and the rails within the limits of these sections are bonded together on each side by one of the usual track circuit wire bonds. At one end of each section is a track relay (B_1 B_2), and at the other a track battery (B B_1) or other source of power for the track relay. The relay and the source of power are each connected to the rails in such a way that when no train is on the section the relay is excited and its armature drawn up; when a train enters the section the relay is short-circuited by its wheels and axles and the armature falls away.

On an electric line Brown's patent arrangement of two polarised relays, as used on the District Railway, could readily be utilised to prevent any risk of operation of the signals by leakage currents.

The armature of the relay carries certain contacts which are closed when the armature is attracted, and for the purpose of this signal it carries also other contacts which will be closed when the armature falls away.

A resistance (O_1 O_2) is inserted between the track battery and the track to prevent the battery itself being short-circuited by the trains; and a parallel circuit is then taken from the battery positive through the contacts of the near track relay to the track conductor, as shown in the figure. The track conductor in each section is thus, when the relay controlled by the section ahead is energised, charged with the potential of the track battery above the negative track rail; but is dead when that relay is shunted. Consequently when any track circuit section is occupied, the track conductor of the track circuit section in rear is dead.

As far as the first and principal indication to be given on the engine is concerned therefore, viz., "clear" and "stop," all that is required is some means of collecting current from the track conductor, and an electromagnet that will when energised show a "clear" signal, and when de-energised show a "stop" signal by the action of gravity.

The action will then be as follows:—

If the section (B_2 B_3) ahead of a train is clear, its relay B_2 will be energised. The battery B_1 will have part of its current shunted through the fixed resistance (O_1) and the wheels and axles of the train (T), while part of the current will pass *vid* the track conductor and the collecting devices on the engine, and *vid* the coils of the signal magnet (S) to the negative rail. The train will thus receive the "clear" signal. Should, on the other hand, the section ahead be occupied (as is the section B_1 B_1), the relay (B_1) being de-energised the track conductor will be dead, and a following train will receive the "stop" signal.

The lower contact of the relay is arranged to connect the track conductor directly to the negative rail of the section, so that in the de-energised position of the relay it will be impossible for there to be sufficient difference of potential between them to retain the signal armature in the "clear" position. Any type of collecting device found suitable can be used, and any number of such devices can, if necessary, be placed in parallel.

To control the motion of the train, the armature of the signal magnet is supplied with contacts placed in a local circuit on the engine which includes electromagnetic valves on the main steam pipe and the train brake pipe; the former to shut off steam, the latter to admit air to a vacuum equipment, or release the air from a Westinghouse one whenever the circuit is opened by the fall of the signal armature. The local circuit on the engine would also, if desired, include a whistle, bell or buzzer, designed to operate

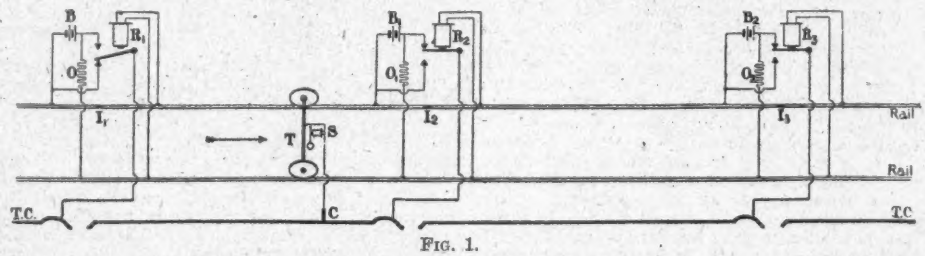

Fig. 1.

when the signal falls, so as still further to attract the attention of the driver.

The cessation of the actively produced, contrary to gravity, "clear" signal would thus not only cause the "stop" signal to appear, but it would also give rise to an audible signal, and further shut off steam and apply the brake. Working with such a system, it would be the duty of the driver on the receipt of a "stop" signal then and there to take steps to aid the automatic control in bringing his train to a stand with all reasonable speed. This done, he will await the receipt of the "clear" signal, knowing that it will reach him, whatever his position on the track, the very instant the section ahead is clear.

The recorder consists of a chart revolved by clockwork under a pen which is controlled by an electromagnet placed in a circuit of the local battery on the engine, and arranged so as to mark the chart when the signal magnet is in the released or "stop" position.

It is necessary to provide that a train receiving a "stop" signal for which no obvious cause exists, may be able, after waiting a reasonable period, to proceed cautiously to the end of the block reported by the automatic signals to be occupied.

A reference to fig. 1 will show that a train proceeding in this manner might eventually receive a "clear" signal, although the block were occupied. A train following the train "T," and approaching from the left, will be perfectly safe up to the insulated joint I_1; should it pass I_1, its collector and its signal magnet will be in parallel with the collector "C" and signal magnet "S" of train "T."

To prevent this, it is proposed to make use of a ramp to open the signal circuit of the following train, on the same general principle as that adopted by the Great Western Railway. The track conductor is ramped in the neighbourhood of, and to the facing side of, each insulated joint. The cab signal has an additional "danger" magnet which controls three contacts, one for its own local circuit, one in series with the collector and the signal magnet, and one to operate an audible signal. Further, when de-energised it causes a shutter marked "danger" to drop by gravity in front of the signal window. The danger magnet is normally excited by the local battery on the engine, the circuit being through its coils and its own contacts in series.

One collector on each side of the engine is so arranged as to be normally insulated from this circuit, but when the collector is raised by means of a ramp, it breaks the local circuit and substitutes for it another circuit from the ramp through the collector and the coils of the danger magnet to earth. If, however, the substituted circuit is dead, the armature of the danger magnet falls away on the opening of the local circuit, and in doing so breaks that circuit a second time at its own contacts. The local battery is consequently unable to resume control of the magnet after the engine has quitted the ramp. But the circuit of the signal magnet is also taken through the contacts of the danger magnet; and consequently the fact of the track conductor being alive beyond I does not result in a "clear" signal. The train would thus traverse the section I_1 I_2 (which is either occupied in some way or else unsignalled in consequence of a breakdown of its equipment, and which is therefore in either case an extremely dangerous zone) with the "danger" signal before the driver. This would be registered on the recorder, and the length of the section being known, the speed at which he traversed it would be indisputably established.

If the delay had been due to the relay (B_1) being out of order, the track conductor in the section I_1 I_2 would have been alive.

Before leaving that section the engine must traverse its danger ramp, which is, however, this time a live one. The auxiliary circuit to earth which is made temporarily by one of the collecting shoes while on a ramp will now energise the danger magnet and

close its contacts, enabling the local battery to resume control as the engine leaves the ramp and closing the circuit of the signal magnet. This is the normal action when quitting each "clear" section, the driver then requiring no notice whatever.

The above indications deal with the track between stations. We may now consider the approach to a station. The train may run in or through on the straight, or it may have to be turned off on to a siding or branch. In the latter case the driver should approach with reduced speed, since it is not safe for him to take points for a turn-out at the same speed as for the straight. To give the warning to reduce speed we utilise an independent ramp, placed (if the track conductor is outside) between the rails of the track.

An additional magnet is supplied to the engine equipment and an additional contact device for the "reduce-speed" ramp. The magnet works on the same principle as the "danger" magnet, but it is proposed that it should merely shut off steam and not affect the brake; this is, however, entirely a matter of what may be desired. The "reduce speed" magnet has a suitably worded shutter which appears by the action of gravity at a separate window placed as close as possible under that at which the "stop," "clear," and "danger" signals are shown. When the magnet is excited the "reduce speed" shutter is drawn up and the window is blank.

The ramp circuit is dependent upon the points, and when these are set for the straight and all is clear, the "reduce speed" shutter will not drop; when set for a turn-out the driver will receive his warning, and with the aid of the recorder it will be possible to determine what action he took upon it. In India, at all events, the speed at which points and station yards are traversed is somewhat frequently a subject of interdepartmental discussion.

But points may be set for the straight when as a matter of practice all is not clear; for a train may be already there, and it may be desired to bring another up against it. The state of the "reduce speed" ramp will therefore depend further upon the relay of the station track circuit section, and its mechanical action will only be electrically cancelled when all is clear for the train.

The "reduce speed" signal will, like the "danger" signal, be entirely beyond the control of the driver, and to remove it a live ramp will be placed at the point beyond which restricted speed is unnecessary.

In the "reduce speed" signal we have all that is necessary to deal with any temporarily or permanently dangerous section of line; viz., a pair of temporary or permanent ramps, the one dead to apply the signal, the other charged to remove it, coupled with a recorder to record the duration of the "reduce speed" signal. The distance between the ramps being known, this gives a permanent record, to be filed in the locomotive superintendent's office or submitted to the manager, of the regard that has been paid to the restriction.

The above has described a "clear" and a "stop" signal for normal use, and has outlined a method of train control: a "danger" signal that comes into play only when the "stop" signal has for any reason been disregarded, and a "reduce speed" signal to meet the case of ordinary speed restrictions, and of the necessity for cautious driving when leaving the straight for a turn-out. These signals can be subjected to manual semi-control in the neighbourhood of stations so as to meet, it is believed, every reasonable requirement of traffic working.

It is, however, possibly further necessary to advise the driver of the actual route set for his train. With certain not inconsiderable limits this can readily be done by means of bars on the track which will be normally dead, but one or other of which will be charged with current according to the setting of the points. The engine will carry a set of contact springs or other device and an indicator which will show the number of the ramp which is charged with current. The indication will not be a primary signal, and the absence of any indication can be treated as a "dead end" signal.

As regards the safety of such a system of signals as here advocated, the essential signal of the equipment is that which gives the indication "clear" and "stop." The "stop" signal is entirely a normal mechanical signal, and has to be held off continuously by a current received from the track conductor under the control of the track relay. Consequently even if the conductor be carried away altogether, the only result can be to stop the train. In the released position of the track relay, the track conductor will be short-circuited, as explained, on the negative lead, so that even leakage currents cannot operate the signal. A leakage across an insulated joint merely lengthens the track circuit section. The control of the motive power and the brake can also be designed so as to be actively prevented from acting by the presence of an electric current, the cessation of which from any cause will cause them to stop the train, and these parts of the equipment appear, therefore, to comply with an exceptionally high standard of safety.

The "reduce speed" and (subsidiary) "danger" signals, according to the method proposed, are gravity signals actively held "off" by the presence of a current, and coming into operation when that current fails. Short of the actual removal of the ramp itself (the equivalent to which in semaphore signalling is the removal of the post itself), every derangement can only result in the signal giving the precautionary indication. The "danger" signal could further only be given after a "stop" signal, and after it had been decided by the train staff to proceed against the "stop" signal, so that it would only come at a time when the train would be moving very slowly and much on the alert, so that even the removal of the ramp (involving a gap in the track conductor) should in this case be detected.

For single-line working there need be no alteration whatever to the engine equipments, and it will therefore be a matter of indifference to the driver whether he is passing over double or single line. The track equipment will still consist of a single track battery and a single track relay per track circuit section; but there will also be a polarised relay, the duty of which it will be to switch the battery and relay connections over from "up" line working to "down" line working, and *vice versa*.

The polarised relays would be in the circuit of the "line clear" instrument used for the dispatch of trains, and would be arranged to work entirely automatically in connection with the issue of an "up" or a "down" token. One result of the equipment will then be that should a train, by overrunning or any other mischance, proceed in a contrary direction to that for which the track has been "set," the rear end of the train will cause the engine to get a "danger" signal, and will thus automatically bring the train to a stand. Even with the best of "line clear" token systems, since cases are not unknown of drivers accepting "line clears" that were not intended for their particular trains, collisions must remain a constant risk in single line working. A grave accident occurred only a few months ago in India when two passenger trains collided head to head, over 100 Europeans and natives being killed.

In India the standard gauge system with the largest number of engines is the Eastern Bengal State Railway, with 0·4 of an engine per mile. A primary signalling equipment consisting of "clear," "stop," "danger," and "reduce speed" indicators, with the necessary contacts, &c., could probably be fitted, at a rough estimate, for about £20 per engine, which at 0·4 of an engine per mile works out to £8 a mile. This can hardly be in excess of what the automatic semaphore with post, valves, or relays, and raising and lowering mechanism, at one semaphore per mile works out to.

Fully equipped with train control as proposed in this paper the cost would, of course, exceed this figure, but it is believed that the track work between stations with half-mile sections (instead of 1 mile as with the semaphore), need not exceed from about £140 to £160 per mile, and the engine equipments from £40 to £50.

Yards would continue to be power or manually worked on any of the well-known systems, but without semaphores or lamps, and the saving in these would go far to meet the cost of the conductor, reduce speed ramp, and indication bars, and their electrical interlocking with the points. The cost of the track work at stations would thus be little, if at all, in excess of present requirements.

Institution of Electrical Engineers.—Leeds Local Section.

On October 28th Mr. H. E. Yerbury delivered his inaugural address as chairman of the Leeds Section. Referring to the present position of electric traction, he remarked that the average price charged for energy supplied to tramway undertakings was 1·42d. per unit, whereas they could generate and distribute it for themselves for 0·39d. per unit, and the total costs with capital charges, &c., only came to 0·66d. per unit. A reduction in the price might, therefore, be reasonably expected. Technical considerations tending towards the attainment of the highest efficiency in tramway working were often ignored, and as great an economy could be effected by training the drivers as by adopting regenerative traction, which did not appear to have made the progress that was expected of it. Greater loads were now imposed upon the motors than they had been designed for, but they endured the strain well; in the future it would doubtless be necessary to install ventilated motors, perhaps of the inter-pole type, to meet modern requirements. The trackless trolley system might prove a valuable feeder to a main line of tramway, the overhead work and cables costing only £3,700 per mile, whilst a double line of track cost £12,000 per mile; the system would be in operation in England in the near future. Single-phase motors, capable of running on both D.C. and A.C. systems, should also be very useful for interurban tramway service. The D.C. turbo-generator had been greatly improved, and further developments might be expected in the design of the turbines.

The Chairman then referred to the study of phenomena on the borderland of the physical, an unexplored field of scientific research of unlimited extent. The laws governing the production of sound and light, and the movement of bodies without any apparent physical cause, were worthy of serious investigation. In the author's opinion ether was the basis upon which must be formulated the laws governing psychical phenomena; the ultimate atom of matter might be a unit of electricity. If they could conceive a four-dimensional region of space, there was no reason why the existence of such region should not provide new conditions of physical operations, and they might have four-dimensional movements of bodies, for an enclosed space of three dimensions would then be open.

The Batti-Wallah Smoker.—The first smoking concert of the season of this society took place at the Holborn Restaurant on Monday, the 2nd inst. The smokers of this society are always an occasion of mirth, nor was this an exception. The programme of song and music was excellent, and since we cannot name every artist who so ably contributed to the evening's entertainment, we may be pardoned for naming only the ladies—Miss Ruby Wilson and Miss Florence Voller. We spent a much happier evening than had we been shedding lightness and lustre on a boiler house or over the restless waves.

Concert.—On Saturday night last a smoking concert of the Electrical Football League was held at the Robertson Electric Lamp Works, at Brook Green, Hammersmith.

COMBINED TRACK-CIRCUIT AND CAB-SIGNALLING.

The paper read by Captain Gardiner, R.E., before the Leeds Local Section of the I.E.E. on the 28th ult. (see abstract on pp. 861-3), proposed to introduce radical changes in the methods of train signalling and control now in use on railways. Put shortly, Captain Gardiner proposed to dispense with signalmen and all the apparatus they operate or control, and substitute a form of track circuit signalling to the cab of the locomotive directly under the observation of the driver. Together with the above, Captain Gardiner proposed to provide some degree of automatic control of the steam and the brakes, and to provide special "reduce speed" indications on the locomotive at any point where it might be desirable. The "reduce speed" indications are distinct from the ordinary signalling, and require additional apparatus on the locomotive and on the line. The essence of the proposals, however, is the adaptation of the track circuit, as hitherto used for the operation of the ordinary outdoor semaphore signals, to cab-signalling, and the principal means by which the required results are to be obtained are of the simplest character.

Signalling is continuous with this system, and this is obtained by the provision of a special contact rail, which is practically continuous. Contact between this rail and the apparatus on the engine is continuous. This rail is connected with, or disconnected from, the cab-signalling battery on the line according to the position of the track-relay armature. The position of the latter is always such as to disconnect the cab-signalling battery if the section is occupied, the rails short circuited, the electrical continuity broken, or just as in the ordinary form where the mechanical signals are operated. "Clear" signals are given and maintained by the presence of a current from the special contact rail; "stop" signals are given by the absence of such current. The "stop" signal shuts off steam and applies the brake, but the arrangements are such that the driver can resume control immediately if he wishes. Indicators are provided on the engine to show the conditions obtaining, and audible signals of different kinds call the driver's attention to the indications. It was all very pretty—and impracticable. The models ran round and round the track, and never caused a single collision—but the pattern is wrong. On a line "worked by one engine in steam," or on a line running directly between two terminal points without junctions, sidings or crossovers, it would, no doubt, serve admirably, and partly justify Captain Gardiner's dictum that "with automatic signalling, as far as indicating the condition of the track is concerned, manual control is not only superfluous, but undesirable."

Automatic signalling systems contain no provision to meet certain conditions of railway work. They cannot deal with junction working without being supplemented by human judgment. They cannot perform the slightest variation from the cycle imposed by their design, without human assistance. They cannot "select." They cannot re-arrange traffic in its order of importance, and without human assistance the simplest shunting operations or deviations from the organised service cannot be carried out. Such a system as that proposed displaces local signalling applicable to local conditions only, by a signal common to the whole line, and having the inherent and ineradicable defect that its failure will retard the train throughout its whole journey. Captain Gardiner does not propose anything to replace functions that the signalman performs other than those of signalling the passage of trains. Yet the signalman performs many other functions. He has to provide for emergencies which are laid down in his code of regulations. There are quite a number of these emergencies provided for in the regulations, which it is unnecessary to specify here.

Captain Gardiner's system of train-signalling is impracticable, not because his proposals are technically defective, but because they do not fit into the scheme of operation. It has not the flexibility to meet the varying conditions of operation on railways. Track-circuit signalling is practicable from an operating point of view, only at places where it fulfils the conditions. Cab-signalling is practicable also from an operating point of view, but as the sole means of conveying intimations of the condition of the line to drivers it has the serious defect already noticed.

In his paper Captain Gardiner speaks very hopefully on the financial aspect of his proposals, and indulges in estimates which may be right or wrong. But he is silent on the very important question of the cost of the present equipment, much of which has come out of capital, and for which, therefore, interest must continue to be provided. If such systems displace the present signalling plant, scrap prices for the latter will only be obtainable, and the capital charges on both systems, together with the maintenance of the automatic system, are likely to swallow any saving that estimates like those given in the paper can show.

If the progress of signalling on railways is traced from its beginnings, it will be found to be gradual and on such lines as experience dictates to strengthen weak places, or to suit the special conditions obtaining. In this country the basis of the system has always been human responsibility. In later years that responsibility has been confined to the signalman's immediate vicinity. In the United States human responsibility is still most largely depended upon, but in certain systems that responsibility has a much wider range than on this side. The development of automatic signalling in the States has sprung from conditions entirely different to those obtaining in this country; such conditions, indeed, as are impossible here. It is useless to transplant anything to conditions unfavourable to its use. Mechanism of this type is no more infallible than man, and depends upon man for its maintenance. Man can reason; mechanism cannot. It may be considered certain that the development of signalling has taken place on the lines most suitable for the service required, and that development has placed man at the point of control. Give men all the help possible to check their natural liability to error, or to know what is required of them and leave them to do the rest. And do not forget that the errors or lapses of highly trained men, such as are found engaged in the service of railways, in controlling or directing traffic, are very small in proportion to the opportunities for such lapses.

ELECTRICAL DRIVING IN COTTON MILLS.

By W. H. BOOTH.

In view of the interest at present exhibited in this matter, some of the misconceptions that have sprung up in respect of turning moments are worth investigation.

Thus one reads of the squeak of belts and the variation of 20 per cent. in shaft rotation as though this were common. It is not common. In a modern cotton mill, rope-driven from a high-speed engine, the most acute ear cannot detect any variation in the hum of the spindles of a ring spinning room or of the preparation room. Nor is belt squeaking to be heard, for all the machines in both these rooms—cards, combs, drawing frames, speed and spinning frames, are continuously at work except when an end breaks, and even this does not apply to the cards or to ring frames. The belts do not slip or squeak on the running machines, for they are powerful enough not to do so; they only squeak when a frame is being started. And this point may be emphasised somewhat, because it is held to be possible to start a frame more quickly electrically, than is done by belt. On this point it will, perhaps, be sufficient to say that a frame may be started to full speed by belt quicker than it is started, but the present practice is adhered to, as the women "tenters" are paid on the piece system, and are aware that they may lose more by starting too quickly than by starting at a gentle acceleration that will not bring down some "ends."

There are no machines in a spinning mill that do not exert a steady resistance excepting the mules. The mule effort varies from almost *nil* to a maximum, and when electrically-driven, demands motors many times more powerful than the mean effort. Hence the difficulty of driving mules electrically with independent motors, and the desirable-

ness of driving them on the group system, with fly-wheel effects near to head stock so as to care for the wide variation of load. The great peak of load of a mule frame comes on just as the carriage has to be started out from the roller beam and the 1,000 or 1,200 spindles have to be set in rotation at 9,000 or 10,000 R.P.M.

Cotton machinery with a motor to every machine looks well. There are no belts to be seen. That is an advantage, as a belt obstructs the light from the windows. But in a modern mill the width is such that there will be two frames in the width of the room and a central alley way, and the belts need not be between the machine and the window.

It is usual when driving a ring frame by its own electric motor to place the motor on the floor in line with the tin roller shaft. To make room for the motor the frame has to be shorter by several spindles than a belt-driven frame, so that, in a recent case investigated, the claimed greater output of yarn per spindle was more than counterbalanced by the reduced number of spindles, as to which more anon. There is thus no special objection to belts, and there is much to be said for them and for group driving. It does not cost much in power to drive the 2 or 3 ft. of shafting, which is all that has to be driven for each ring frame, or even for speed frames. Wherefore there is little loss in driving a room by line shafting with a motor on the end of it, or, better still, in the mid-length of the shaft. It is not as though ring frames were often starting and stopping. They run continuously until their bobbins are filled, are then doffed and started again to run until time to doff. In mills spinning good material, there is very little stoppage of the speed frames, though, of course, the spindles being driven by helicoidal gears, the frame must be stopped when an end fails. The cards, too, stop very little, certainly not sufficiently to give any advantage at present to other than group driving, especially as a card carries its own fly-wheel in the shape of the heavy quick-running cylinder.

To return to the question of spindle output, there seems to be a curious dearth of information on this question. It is often stated that the output per spindle is greater with electrical driving. In seeking to know if this was so, a visit was paid to an electrically-driven mill with a motor to each ring frame, and information was sought as to the alleged greater output per spindle. An electrically-driven frame was shown; before running this frame by electrical means in a nice light room, from a new steam engine, it was first rigged up in a room in an old mill and driven by belt, and it was found that the output was increased by electrical driving. A request was made to be shown the engines of the old mill. They proved to be an old pair of beam engines running at 40 R.P.M., and it was obvious to the roughest ear that they were very much out of balance. The new mill engine driving the electrical generator was next visited. This proved to be a three-crank triple-expansion engine running at 125 R.P.M., and possessing, therefore, over nine-fold the fly-wheel effect per pound of rim, more or less, according to diameter, and 50 per cent. more impulses per turn, or, in all, nearly five-fold the number of impulses tempered by nine-fold the fly-wheel governance. The new engine also was not out of balance. It is much to be feared that the foregoing is a very ordinary sample, out of which many of the so-called better results are manufactured. The results of unduly favourable prophecy are thus very often disappointing, and, even if spindle output be increased, say, 5 per cent., in any authenticated genuine test, under fair conditions, is it worth doing this at the expense of 7 per cent. of the spindles cut away to make room for the separate motor? The fact may as well be faced that a modern rope-driven mill does possess steady turning. Its load factor is over double that of probably any external power station in the country. The loss by ropes and line shafts is probably no greater than the sum of the electrical losses at the generator, in the cables, and at the motors; and so far it appears that electrical driving requires more power for a given number of spindles than is demanded with rope driving. That electrical driving possesses many conveniences goes without saying, and, as it is yet in its infancy, there are improvements in the not distant future. But it is essential that it should show a commercial economy, and it is most essential that its advocates should endeavour to acquire a practical knowledge of cotton spinning so that they may avoid the pitfalls before them. A cotton mill is not a shipyard with widely scattered machines here and there. Yet electrical advocates will argue as though they were dealing with shipyard conditions, and they very grotesquely over-rate the friction of line shafting. A cotton mill is simply packed full of machinery with very little shafting per machine, and that little often balanced as to belt pull, right and left of the shaft. In what follows there will be found set down the estimates of three methods of driving a fine spinning mill of 110,000 spindles. These include the capital cost of the power department, and such building as properly appertains thereto, such as the rope-race in the case of the rope-driven mill, and boiler plant for the heating of the mill, which is driven electrically from an external power station. This necessity to warm a mill tells considerably against the electrical method of driving. It might be added that in the opinion of some engineers everything has not yet been done in the case of the rope-driven mill to properly utilise the waste heat of the engines for the purposes of mill warming. A mill must be warmed throughout the winter months by heat beyond that frictionally generated by the machinery. In summer, this frictionally generated heat is often more than is called for, and the temperature becomes unnecessarily high. Modern mills, particularly, call for a considerable weight of coal in winter, as the window area is large and the loss by radiation great. A piercer on a fine mule often works with but one thin garment, and he is even then too warm, the atmosphere being artificially humidified so as to render the fibres soft, and produce better spinning.

As an example of the amount of shafting per machine, may be cited a mill where two shafts of 660 ft. in length drive 150 machines, and two other shafts drive 134 machines. In the same mill there are 30 mules averaging only 10 ft. of shafting each. Since these mules will make four to five draws per minute, there will, on an average, be one maximum stress on the shaft every 2 to $2\frac{1}{2}$ seconds, and with 30 different machines under the ordinary operative conditions, exact coincidences of peaks will be rare. Obviously, the mule shaft is one that should have its separate motor, or, better still, its two or 3 motors at intervals, so as to minimise the torsion angle. In this particular mule room there are 40,000 spindles, and the shaft will transmit an average of about 300 H.P., or about 10 H.P. per machine. With machinery of this class, therefore, the separate motor system involves an enormous provision of motor horse-power.

And generally, all machines which are required to make occasional starts and stoppages, such as the speed frames, must have motors of a capacity considerably beyond the mean rate of working. Ring frames do not require such excess capacity.

Now with the group system, each machine, when starting after a stoppage, can call upon the surplus capacity of the one or two large motors on the group shaft, and with suitable belt or rope proportions, can be accelerated as quickly as is good for it. In times gone by, it was very usual to drive spinning frames or throstles—the forerunners of the ring frame of to-day—from a shaft in the room below. Long belts were used, carried horizontally round gallows pulleys, and passed up through floor slots to the machine pulley. No belts could be seen in a room thus driven, and the room was even clearer of obstruction than if it had been driven on the separate-motor system, which is claimed, very rightly, to give such a good appearance to a spinning room.

There are certain advantages in electrical driving, but it is a mistake to make claims which cannot be justified, and it certainly does seem difficult to get genuine comparative figures of electrical and rope driving that will satisfy men who are both engineers and cotton spinners. The comparisons of which one reads appear to be made on the lines detailed above, with old ropes or gears and old slow engines, and they are absolutely untrustworthy. The three estimates here given were made quite recently at the same time, so that there is no correction for price differences. One thing is certain, both in mechanical and electrical methods, the machines will run practically as regularly as the prime mover. The interposition of ropes will, if anything, cause the line shafting to run more evenly than the engine, because, if any pulsation were present, the rope elasticity would

deaden it. The result is proved by the ear—a test that cannot be gainsaid. And, with the same engines, electricity cannot do more. In particular no claim should be made that electric driving can be carried out so as to consume less power than rope driving. It cannot yet be shown to be possible, and disappointment follows on such unnecessary claims. Indeed, harm has been done already by the claims put forward for electrical driving by men who, to begin with, have no practical knowledge of cotton spinning, and do not differentiate between the mills of to-day and those of 30 or 40 years ago. It may be asked why rope driving so quickly displaced gearing. It did not cost much, if anything, less to install, and the running expenses were greater. The true reason was probably that ropes necessitated a pulley of large diameter and great breadth, with a very much greater fly-wheel effect than the equivalent toothed rim. It was this fly-wheel effect that gave the steady running with ropes and gave to ropes a good character, and it was to the bearing friction thus set up that the greater turning effort was due. The same fly-wheel effect is necessary to give equal turning with electrical transmission.

The estimates show that the rope race is not such a heavy item as often supposed, with the extra gearing and stairs, but some £1,900 can be saved on the three items. But for a mill with its own generation, the rope cost of £450 plus the £1,140 of extra gearing, looks small beside the £4,000 for motors and cables. The total electrical cost, however, only comes out a bare 16 per cent. greater than the mechanical drive, and the annual costs are about 23 per cent. greater. This is, of course, due to the fact that in electrical driving there is fully three times as much highly organised machinery as there is in a mechanical drive. There is the engine which must be a little larger; there is a costly generator a little more powerful again, and there are the motors which must average, perhaps, 20 or 30 per cent. greater capacity than the engine, if not still more. The generator, the motors, and the cables and switches take the place of 30 or 40 turned rope grooves, an equal number of ropes, which are of cotton, and help the trade, and some turned pulleys and cheap straight shafting.

(*To be concluded.*)

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Selection of Turbo-Alternators.

The paper read by Dr. Kloss before the Manchester Section of the I.E.E. met with considerable criticism. There is little doubt that the paper was written from a designer's point of view, and Dr. Kloss proved that good inherent regulation can only be obtained at considerable cost. It seems strange that (with the exception of Mr. Peck) none of the engineers who contributed to the discussion made any reference to the Tirrill automatic regulator, or suchlike devices, whereby an absolutely steady and constant voltage is maintained from no load to full load. The writer believes that there are regulators of this type at work controlling the voltage of generators where the pressure drop on inductive load cos. θ 0·8 is as much as 40 per cent. Other devices depending on the temperature-resistance qualities of metal have been proposed, and an exhaustive article dealing with the subject appeared in the *Electrotechnische Zeitschrift* recently.

As pointed out by Mr. Law, the question of regulation is generally kept well in the background, and it is also difficult to make a good test. In most of the turbo-alternators now at work it would be found that the regulation on inductive load cos. θ 0·8 is nearer 40 per cent. than 20 per cent.

This is no disadvantage, if an efficient and cheap machine is the result, assuming that a suitable regulator is used in connection with the same.

The Tirrill regulator, which is manufactured in England by the B.T.-H. Co., and on the Continent by the A.E.G., Berlin, controls the voltage of the alternator through the medium of the exciter field. A resistance in series with the exciter field is automatically and rapidly open and short-circuited, the periods being automatically arranged, so that the proper line voltage is obtained on the alternator.

The cost of such a regulator is not great. Why, then, raise such a dust regarding regulation, especially when lecturing (avowedly) to purchasing engineers?

Such people generally require a set, the overall efficiency of which is high and the voltage constant, and problems of pure design do not always touch their hearts.

The above letter is written with a view to clearing up some misapprehension as to the voltage regulation obtainable by means other than those dealt with in the paper in question.

J. H. Thomas.

Manchester, *November 7th*, 1908.

What is an Electrician?

In reference to your "Note" in last week's issue on "What is an Electrician?" I had a similar conversation a few days ago with one of the directors of a large contracting firm in this city. He, I may say, is a civil engineer. I am an engine-driver "with electrical experience," in the employ of his firm. He had just had a conversation with our "electrical engineer," seeking advice as to whether it would be policy to transform our 200-volt D.C. down to 100 volts, and so prevent the necessity of connecting our metallic lamps in series. I do not know what kind of advice he got; suffice it to say that he came to me and said, "We have decided to get prices for a transformer to give us 100 volts for our tantalum lamp circuits." I assured him that he could not deal with continuous current in a transformer, and also told him that from our battery he could get any required voltage for his purpose. He left me with a blank look, and our "electrical engineer" cuts me now. What have I done?

Engine Driver.

Sheffield, *November 9th*, 1908.

Branches v. Agencies.

I have read a letter from "Ramifex" in this week's issue, and note that he has gained much profit from reading my article. I do not wish to seem egotistical, but would suggest that more profit still might accrue if he read it a second time. When I wrote the article I expected criticism—and lots of it. The fact that it was received in silence by all branch managers seems a proof of its truth. I do not know if "Ramifex" intends his letter to be taken seriously, but the gist of his argument (or statement) seems to be that branches were established to pay for themselves, and consequently do, with a vague reference to load-factors and efficiency. This reminds me of Voltaire's famous remark that "Everything is for the best in this best of all possible worlds." It is probable that Noah made the same statements about efficiency and load factor to Mrs. Noah every night as they fed their collection of two-phase passengers; and he may even have claimed a record journey when he stranded on Mount Ararat. But this is hardly a sound argument in favour of arks (even short-circuiting ones) for present-day use. To use a modern simile, there was, until a few years ago, a tramway route in Birmingham run by accumulators. It was built to pay, like branches. It did pay, in a kind of way—like branches. Its load factor varied largely, and its standing charges did not. It was very inefficient; each car carrying, say, 40 passengers dragged x tons of lead, and carrying one passenger also dragged x tons of lead. Up a hill it usually travelled 4 miles an hour. The man who constructed it knew, or thought he knew, his business. Now it is dead and buried, and a much more efficient and better-paying trolley system is installed. That is where the analogy gets ahead of us—we still have branches.

I do not think I stated that branches did not pay. That depends altogether on the definition of paying. What I stated were arguments against standing charges, and figures to prove that most branches did not pay as well as agencies. Business is not like Euclid, full of self-evident propositions, and sweeping assertions are not convincing. I gave figures

to support my arguments, and if "Ramifex" can do the same I would welcome any light on what I consider to be a serious problem.

Vilex.

A Periodic Function.

Under the above heading your correspondent "A. K.," in your issue of October 23rd, struck a very severe note for a large army of the rising generation who have already chosen the electrical profession.

The scramble over every advertised vacancy for practically a labourer's wage is sad to think about—but what can you expect when large public companies and firms take, under the guise of training them, large numbers of youths, and after a year or two turn them adrift to flood the already overstocked market, and again take on a fresh batch of recruits? Surely our princes of the profession should have more sympathy with the young members of the profession.

Interested.

Auto-Transformers.

In reply to "F. D.'s" letter in your issue of October 30th, I did not make any specific allowance for fixing and connecting up the transformer, as this must necessarily be a variable item, according to circumstances. In the case of a new installation, the extra cost of fixing and connecting up the transformer would be so small that it is unlikely that a wiring contractor would make any extra charge, especially as he would get a substantial discount off the list prices on which I based my estimate. If it were a question of altering an existing installation, a small extra charge would probably be made for this work, but it is hardly possible to give any general estimate.

My example of comparative cost was intended to serve as a typical instance of the saving to the consumer which may usually be expected. In making an exact estimate for any specific installation several other points should be taken into consideration, such as the initial cost of wiring. If a 200-volt installation for carbon-filament lamps be compared with a 50-volt installation for metallic-filament lamps, or if the respective voltages be 100 and 25, the cost of wiring at the lower voltage should be appreciably less, as it is obviously unnecessary to maintain the same standard of insulation in the wires and fittings; but if the respective voltages be 200 and 25, the extra cost of copper will probably out-balance any saving due to cheaper insulation.

I should like to emphasise the importance of thoroughly effective joints and contacts in low-voltage installations, as I feel sure that the present method of making dry joints into the terminals of distributing boards and looping in between switches and fittings will lead to trouble, unless proper care is taken to ensure an adequate contact surface, both in terminals and in the rubbing contacts of switches and wall plugs. Even at 100 volts and 200 volts the present methods can hardly be considered altogether satisfactory, as I think most of us have come across switches and wall plugs which require a certain amount of "juggling" before sufficient contact is obtained to light up the lamp.

The subject of low-voltage installations is one that deserves very careful consideration, as it affords possibilities of greatly reducing our present wiring costs, and there is urgent necessity for a revised standard of wiring rules applicable to such cases.

To return to the example of comparative cost, I think I have probably over-estimated the difference in the cost of renewals, as I allowed for a life of 1,000 hours per lamp in each case; in view of the fact that there is so little falling-off in the C.P. of metallic-filament lamps, I think it would be quite safe to assume that a 25-volt or 50-volt metallic-filament lamp will have at least 50 per cent. longer useful life than, say, a 200-volt carbon-filament lamp.

As regards fitting a control switch to the transformer, I have never been able to understand the necessity for this in private houses, as it is already obligatory, under the I.E.E. and other wiring rules, that a main D.P. switch be fitted at the point of entry into the premises, and the consumer may just as well switch the whole installation, including transformer, on and off, by means of this switch, if he is going to take the trouble to do so at all. A second switch at the transformer appears to be superfluous, unless the main switch happens to be in a position which is not conveniently accessible.

J. L. Cateaux.

London, E.C., *November 10th*, 1908.

Metallic Filaments.—A correspondent wishes for the names of makers of metallic filaments for use in the manufacture of metallic-filament lamps.

Carborundum Resistances.—A correspondent wants the address of the firm which exhibited carborundum resistance rods at the Manchester Exhibition.

Hysteresis Tester.—A correspondent is desirous of meeting with anyone versed in the use of Ewing's hysteresis tester, who would be willing to fraternise with him.

ELECTRIC RAILWAYS IN GERMANY.

It seems after all that the determination really exists to proceed with the construction of electric railways in certain parts of Germany after a period of almost complete stagnation extending over several years. Apart from the conversion of some of the Baden State railways and the intention to establish a new underground line in the suburbs of Berlin, to which a brief reference was made in the Review on September 11th, the most important scheme under consideration is the comprehensive proposal to transform the Berlin City, Circle and suburban railways under the auspices of the Prussian Railway Administration. The Berlin Railway Administration, as was mentioned in this journal some time ago, organised a technical department which started its labours last spring in the direction of ascertaining the initial bases for the projected conversion, and in the preparation of plans for the purpose, whilst the leading electrical firms, comprising two or three groups at the most, are engaged on the elaboration of schemes in respect of the superstructure of the railways, the trains, and the stations for the transmission of power.

The fact that the principal electrical firms are proceeding with the preparation of the schemes, at the instance of the Minister for Railways, seems to suggest the prospect of the work of conversion being commenced at no distant date, but the estimated expenditure represents a formidable sum which has hitherto almost overwhelmed the Minister of Finance. It is calculated that the outlay on the transformation of the city railways would amount to £9,000,000, and this enormous sum has hitherto stood in the way of the Prussian Minister of Finance, and has, consequently, prevented the submission of any definite proposal to the Diet. The Railway Administration has, however, arrived at the conclusion that the electrification is a necessity from a technical working point of view, and this opinion has been fully expressed in a memorial which will serve as the basis for the negotiations between the two Government departments in question.

The Berlin Railway Administration, on the assumption that the Minister for Railways will be able to convince himself, and subsequently the Diet, that the capital required for the conversion of the city railways could be raised without any difficulty, is confronted with the task of deciding the particular point at which the work of transformation should be commenced, especially as the authorities have no experience in respect of such a gigantic task. It is asserted that the suburban electric railway between the Potsdamer Ringbahnhof and Gross Lichterfeld-Ost is too small to allow of a comparison, whilst the suburban railway between Blankenese, Hamburg, and Ohlsdorf cannot be drawn upon for the same purpose, as the service by no means resembles the heavy traffic which has to be handled in Berlin. In these circumstances it is thought that if the comprehensive scheme is proceeded with, a beginning will be made on a busy suburban line, and that the Wannsee railway, as an independent or self-contained line, will be taken into consideration in the first place.

Pending any developments in connection with the State railways in Berlin, the fact has to be noted that the Town Council of Schoneberg has concluded a contract for the construction of an underground railway between this metropolitan suburb and the capital itself. Various schemes have been under consideration for several years past with a view to providing a more rapid means of communication between the two districts, and the decision to proceed with one has been arrived at almost as suddenly as the actual commencement of the works. The route of the railway is from the most northern part of Schoneberg at the Nollendorfplatz to the junction of the Haupt Strasse and the Innsbrucker Strasse at the Circle Railway. It is intended to construct the line similarly to the Berlin underground electric railway—that is to say, as a shallow tunnel line, and the total length will be 1·86 mile. The railway will be a municipal undertaking, and will be provided with fiv

stations. The contract has been entrusted to the Siemens & Halske Co. for the sum of £510,000 and the earthworks were commenced on the day following the decision of the Town Council to enter into the contract. It should be added that the Council and the Continental Co. for Electrical Enterprises were in communication some time ago on the subject of the erection of a suspended railway, but the negotiations led to no practical result. The Council also negotiated with the Berlin Elevated and Underground Railway Co. in regard to the assumption of the duty of working the railway now decided upon, but the correspondence was discontinued because the company, it is alleged, sought for permission, without the knowledge of the Council, for two lines crossing the extension of the Schoneberg line to the inner portion of Berlin.

The scheme approved by the Baden State Railway authorities, who have combined consideration for merely a comparatively short time with rapidity of action, relates to the conversion of slightly over 30 miles of line. The sections concerned are those between Basle and Zell and between Schopfheim and Säckingen. These are to be equipped with the single-phase alternating-current system at 10,000 volts and 15 periods, as projected by the Siemens-Schuckert Co. It is proposed to obtain the power from the Augst-Wyhlen works, in which the Rheinfelden Power Transmission Co. is interested. The order for the transforming plant, the feeders and overhead network and for 10 locomotives, each of 1,000 H.P. for the Basle-Zell section, has been given to the Siemens-Schuckert Co., and that for the overhead network between Schopfheim and Säckingen to the Allgemeine Electricity Co., whilst Brown, Boveri & Co. will supply two locomotives, and the Felten & Guilleaume-Lahmeyer Co. the transmission line from the power station to Basle. It is stated that the value of these orders does not exceed £200,000.

The fact that the Baden State Railway authorities have decided not to build a generating station, but to purchase electrical energy from an outside source, is considered to be of importance in suggesting what may possibly happen in other directions in the near future. It is, in fact, asserted with assurance that the Prussian State Railway authorities are following with interest the origination or development of projects for power supply works which are in progress in the coal and lignite districts, and they are actually said to be participating in the preparation of a scheme for a central station in the lignite locality of Halle-Weissenfels. However this may be, it seems certain that a fresh start in railway enterprise has now been commenced, although the monetary value of the orders already placed is not very considerable from the actual electrical engineering point of view. At the same time the new era may produce further developments, in connection, among others, with the Bavarian railways, but there is no probability that any possible extensions of business will cause the leading firms to restrict their competition in other directions, as has been suggested by a Berlin newspaper, seeing that the receipt of larger orders would simply be followed by an extension of the staff and workmen in order to cope with them. It would also stimulate other firms to embark upon the same class of railway work, as, indeed, one company, as reported a short time ago, has already done in connection with the utilisation of the Westinghouse patents.

NEW PATENTS APPLIED FOR, 1908.

Compiled expressly for this Journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

22,681. "Improved hanger for trolley wires." H. Schutte. October 26th. (Complete.)

22,686. "Means whereby a rise in temperature beyond a predetermined point is utilised in automatically closing an electric circuit for giving an alarm or for other purpose." D. Carnegie. October 26th.

22,687. "Improvements in mechanism for regulating the operation of electric controllers." P. T. J. Estler and A. Hudson. October 26th.

22,688. "Improvements in or connected with electric cut-outs." J. Farley and W. Cook. October 26th.

22,713. "Improved device for driving electric secondary clocks." W. Fairweather. (Aktiebolaget L. M. Ericsson & Co., Sweden.) October 26th. (Complete.)

22,721. "Process for use in preparing electrotype moulds for the electrolytic bath." H. W. Lake. (A. W. Harrison, United States.) October 26th. (Complete.)

"22,740. "Improved electric motor for high-tension currents." N. Myschkin. October 26th. (Complete.)

22,750. "Electric ring gripper." F. Croft. October 27th.

22,768. "Improvements in ironclad switches." F. S. Horrocks and T. C. Lett. October 27th.

22,817. "Improvements in electrical tumbler switches." A. F. Wileman. October 27th.

22,819. "Improvements in electric clocks." T. J. Murday. October 27th.

22,894. "Improvements in and in apparatus for the electrolytic production of sodium and the like." Societe d'Electro Chimie. (Date applied for under Sec. 91 of the Act, November 2nd, 1907, being date of application in France. October 27th. (Complete.)

22,880. "Improvements relating to the control of marine electric steering gear." B. Parker-Haigh. October 28th.

22,903. "Combination high and low tension electric switch for petrol or gas engines." C. Willeby. October 28th.

22,911. "Improvements in electrically-operated lifts." E. M. T. Boddam. October 28th.

22,951. "Combined trolley wheel and sleet cutter." E. M. Schollenberger. (Date applied for under Sec. 91 of the Act, October 30th, 1907, being date of application in United States.) October 28th. (Complete.)

22,964. "Improvements in means for holding globes or shades in the galleries of electric light, gas and other fittings." S. Falk. October 28th.

22,971. "Improvements in electrical accumulator plates." A. Suffolk and C. F. Green. October 29th.

22,997. "Improved apparatus for registering telephonic calls." W. M. Heed and A. Esplen. October 29th.

23,007. "Improvements relating to the manufacture of electric conductors." P. MacGahan. (Date applied for under Sec. 91 of the Act, November 8th, 1907, being date of application in United States.) October 29th. (Complete.)

23,053. "Fixings for electric fittings." J. J. Rawlings. October 29th.

23,064. "Improvements relating to systems of electrical distribution by alternating current transformers." J. S. Peck. October 29th.

23,069. "Improvements in and relating to supports for filaments of incandescent electric lamps." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 29th. (Application for Patent of Addition to No. 16,531/1907.) (Complete.)

23,070. "Improvements in and relating to the supply and regulation of the electric energy employed in the operation of arc lamps used in search-lights and like apparatus." British Thomson-Houston Co., Ltd., and A. A. Pollock. October 29th. (Application for Patent of Addition to No. 4,879/1905.)

23,071. "Improvements in and relating to electric furnaces." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) October 29th. (Complete.)

23,110. "Improvements in terminal connecting boxes for tramway and like motors." H. Weston. October 30th.

23,111. "Improvements in the method of and apparatus for controlling electric cranes." E. M. Holmf. October 30th.

23,116. "Improvements in electric candle fittings." H. Hirst and J. H. Collings. October 30th.

23,118. "Improved automatic battery switch." Nalder Bros. & Thompson, Ltd., and F. H. Nalder. October 30th.

23,120. "Improvements in an electrical communication system and apparatus for causing the motions of a mechanism to be reproduced as rotary motions by other separate and distinct mechanisms." R. A. Palmer. October 30th.

23,132. "Improvements in insulating acid and damp-proof materials for use in galvanic batteries and for other purposes. J. T. Szek. October 30th.

23,145. "Improvements in starting mechanism for electric motors." G. T. Fairbrother. October 30th.

23,161. "Automatic air brake for steam, electric, or other railways." R. Kropf. October 30th.

23,164. "Electric controlling and registering device." J. Kaiser. October 30th.

23,170. "Improvements in and relating to apparatus for the production of continuous electrical oscillations, and to the application of the same." H. Manders. October 30th.

23,193. "Improvements in and relating to electro-deposition of metals." J. J. N. Brachmann. October 30th. (Complete.)

23,196. "Improvements in locking and unlocking miners' safety lamps by electricity, magnetism, springs, or compressed air." W. Patterson and J. Thomas. October 30th.

23,205. "Simplified clip or clamp for attaching transmission lines to insulators." H. MacK. Sillar. October 31st.

23,261. "New or improved covering for electric cables and other like articles." S. Patterson and J. W. Bass. October 31st.

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1907.

Cooling of Dynamo-Electric Machines. Phœnix Dynamo Manufacturing Co. and R. Pohl. 25,902. November 22nd.

Electrically-Operated Winches. Aarhus Dynamo and Electro Motor-Fabrik and S. P. Johansen. 25,998. November 23rd.

Electric Distribution Systems. British Thomson-Houston Co. and E. B. Wedmore. 27,131. December 7th.

Dynamo-Electric Machines. Mather & Platt, Ltd., A. C. Coubrough and J. Frith. 27,596. December 14th.

Generation, Control and Transmission of Electric Energy, Particularly Applicable for Use on Automobiles and the like Vehicles. A. H. Midgley. 28,143. December 20th.

Collapsible Trolley Pole for Electric Vehicles. G. S. Thomson. 28,281. December 23rd.

Electric Signalling on Railways and Controlling Trains Independently of Drivers. A. Gardiner. 28,436. December 27th.

1908.

Manufacture of a Conducting Connection for Use in Electric Incandescent Lamps. W. E. Lake. (Elektrische Gluhlampenfabrik, Watt, Scharf, Loti, and Latzko, Austria.) 4,760. March 3rd.

Alternating-Current Relay Devices. L. F. Howard. 4,948. March 4th. (Date applied for under International Convention, April 25th, 1907.)

Incandescent Lamp Sockets. F. A. Swan. 5,318. March 9th. (Date applied for under International Convention, March 15th, 1907.)

Trolleys or Collectors for Electricity. C. Harkness. 5,402. March 10th.

Incandescence Electric Lamps. C. H. Stearn and C. F. Topham. 5,560. March 12th.

Means for Electric Lighting in Connection with Bicycles, Motor-Cars and the like. A. Wiigh. 5,972. March 17th.

Metal-Filament Electric Lamps. Westinghouse Metal-Filament Lamp Co. 6,245. March 20th. (Date applied for under International Convention, March 27th, 1907.)

Electrical Devices for the Measurement of Speeds. Elektricitäts Ges. Alioth. 8,205. April 13th. (Date applied for under International Convention, May 2nd, 1907.)

Apparatus for Disinfecting Telephones. T. Lutz. 8,887. April 23rd.

Electricity Meters for Use in Connection with the Charging and Discharging of Storage Batteries. H. Aron. 9,288. April 29th.

Three-Phase Commutator Dynamo-Electric Machines. Siemens Schuckertwerke Ges. 9,638. May 4th. (Date applied for under International Convention, July 13th, 1907.)

Electro-Automatic Sounding Apparatus. C. F. Varela. 11,814. May 30th. (Application for Patent of Addition to No. 5,444/08.)

Metal Coated Negative Carbons for Searchlights and the Like. Siemens Bros. Dynamo Works, Ltd. (Siemens Schuckertwerke Ges., Germany.) 12,556. June 11th.

Ignition Apparatus for Internal-Combustion Engines. Firm of R. Bosch. 13,627. June 25th. (Date applied for under International Convention, September 7th, 1907.)

Induction Supply Meters for Polyphase Electric Currents. H. Aron. 14,340. July 6th.

Adjustable Iron Electric Insulator Support. J. Konig. 15,910. July 27th.